BIBLIOGRAPHY

CINDY RUTH B. BACASION. APRIL 2012. Effect of Intermittent Lighting Program on the Performance of Broilers.Benguet State University, La Trinidad, Benguet.

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ABSTRACT

This study was conducted to determine the effect of intermittent lighting program on the growth rate, feed intake, conversion efficiency, morbidity and mortality rates and the return on investment in broilers.

A total of 120 21-day old broilers were randomly distributed to 3 lighting regimens as follows: 23-hour light and 1-hour darkness as control, cycle of 45-minute light and 15-minute darkness, and cycle of 15-minute light and 2-hour darkness.

The result of this study showed that intermittent light did not affect the final weight of birds at 45 days of age, feed conversion ratio, feed cost per kilogram gain in weight and dressing percentage. The average feed conversion ratio of broilers obtained in this study was 1.407. Highly significant differences were observed in the feed intake and gain in weight of birds exposed to longer light period. Birds exposed to 23-hour light and 1-hour darkness had a higher daily feed intake (0.155kg) and daily gain in weight (0.042kg) than birds exposed to 45-minute light and 15-minute darkness that had a daily feed intake of 0.128kg with a daily gain in weight of 0.0385kg and those exposed to 15-minute light and 2-hour darkness that had a daily feed intake of 0.127kg with a gain in weight of 0.0363kg.

It is concluded that birds subjected to 23-hour light and 1-hour darkness (cycle for 24 hours) and birds subjected to 15-minute light and 2-hour darkness (cycle for 24 hours) had the same performance thus subjecting birds to 45-minute light and 15-minute darkness is recommended.

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INTRODUCTION

Rearing broiler chicks under continuous lighting conditions has been known for many years that it would give a maximal early growth rate due to higher feed consumption. However, there's a continuous research dealing with the effects of different lighting programs as part of the production programs.

Lighting programs in broiler production have evolved over the years, with success in improving live performance. However, the relatively recent and rapid improvement in broiler growth rate has renewed interest in lighting programs as an aid in restricting early growth. Since withholding light is a mild form of feed restriction, lighting programs can be applied during critical periods in the broiler grow out or limit or modify early growth and then capture compensatory gain in the later part of the grow out (The Alabama Poultry Engineering and Economics Newsletter, 2006).

Light enables the birds to eat continuously thus; it is believed to result in a maximum growth rate. Darkness on the other hand helps to stimulate melatonin, vitamin D3 and other hormone levels in the blood that improve the chick's immune system and tissue development (Animal Industry Branch, Manitoba Agriculture and Food, 2007).

Nonetheless basing from competent researches made by authorities, sufficient light boosts and increase the activity of the birds. That which although fed by much and greater feeds, the feed conversion ratio is still lower as compared to birds with longer dark periods with less feed consumption that results to less energy consumption due to the lessen activity of the birds.

The study was conducted to find out if using intermittent or alternate on and off lighting program was effective and productive or not. Result of this study not only

benefit farmers, but can serve as benchmark data for further studies on better lighting programs.

The study aimed to determine the effect of lighting programs on the growth performance of broilers and to determine which lighting program promotes faster growth and better performance of the broilers. Specifically, the study aimed to determine the effect of intermittent lighting program on the growth rate, feed intake and conversion efficiency of broilers; to determine morbidity and mortality rates in broilers subjected to intermittent lighting program; and to determine effect of intermittent lighting program on the return on investment in broiler production.

This study was conducted at Midas, Ohio, Ucab, Itogon, Benguet from November to December, 2011.

REVIEW OF LITERATURE

Some authorities have expressed the opinion that with continuous lighting, chicks are able to eat continuously and thereby, grow at a faster rate. Studies have shown however that although lighted birds consumed more feeds, it does not necessarily mean they would weigh more than those on shorter light periods. Other authorities, on the other hand maintain that young chicks need a good rest and a good rest is almost impossible in the presence of lights (Fronda, 1972).

Aerts*et al*., (2000) as cited by Daghir, (2008) stated that the use of intermittent light has been shown to increase feed consumption during the cooler part of the day. Intermittent lighting had been shown to improve feed efficiency in the broilers and this improvement can be due to the lower heat production during the dark period.

Turning the lights off is one best thing that you can do for the young meat-type chickens. By giving birds short days and long nights from one week to three weeks of age, it help maintain a healthy body and rapid growth rate. Long dark periods help stimulate melatonin, vitamin D3 and other hormone levels in the blood that improves the chick's immune system and tissue development. Limiting the hour of light will slow growth slightly, allowing the birds to develop strong hearts and bones needed to support rapid growth later in the flocks. Turning the lights off when birds are young produces benefits that can last in the flocks (Animal Industry Branch, Manitoba Agriculture and Food, 2007).

The technology of broiler production stipulates a 23-hour light regime (with half an hour or an hour of darkness) in order to enhance feed intake and weight gain. The short period of darkness is intended to get the broilers need to the absence of light that

may occur to possible power supply failure. The decrease of the light regimen resulted in a significant decrease of the body weight. Broiler liveability increased in the groups with higher periods of darkness mainly due to lower incidence of the sudden death syndrome (Parvu*et al*., 2004).

Recent studies of Scheele *et al*., Gordon (1997) as cited by Parvu*et al*. (2004) have shown that mortality and the incidence of feet diseases increased in the birds with longer light regimens. It is an established fact that light influences the activity of the anterior hypothesis and of the hormonal factors of growth.

There had been various lighting patterns tried like subjecting birds to alternate light and darkness of varying length. Clegg and Sanford (1951) as cited by Patulot (1984) observed heavier weight of broilers exposed to short periods alternate light and darkness.

Birds do not normally feed during the dark period but will do so if the photo period is very short for instance 6 hours or less (Morris, 1967) cited by Appleby *et al*., (2004) intermittent lighting patterns are gaining more increasing acceptance for commercial rearing, particularly for broiler production, and birds respond by modifying their feeding activity appropriately (Lewis *et al.*, (1957) as cited by Appleby *et al*., (2004).

Bright lights also have various effects to the behaviors that are adverse for either the owner or the birds. It increases the activity, and probably for this reason tends to decrease growth (Cherry and Barwid, 1962) cited by Appleby *et al*., (2004) because activity uses energy. It also increases aggression and feather pecking.

Dozier (2002) as cited by Basalong (2006) observed that increasing lighting program decreased leg abnormalities and total mortality was also significantly reduced,

less respiratory lesion and better immunity to respiratory diseases than in poultry that were exposed to constant light. The health of the bird was improved due to melatonin hormone produced during the dark periods. Dozier noticed that low light intensity helped control bird activity, thus, improving feed conversion. He further stated that broiler growers should consider not only controlling the number of hours but as well as light intensity. He added that lighting system and programs that is best for a particular company or producer depends on the type of housing, the type of birds grown, climate and electricity.

According to the studies of Basalong (2006) and Macliing (2001) the final weight of the birds were not affected by the light and dark periods.

MATERIALS AND METHODS

The materials and equipment used in this study were the following: 120 21-day-old cobb broiler chicks, feeds, antibiotics, vitamins and minerals, brooding rearing cages, feeders, drinkers, electric wiring and sockets, 100-watt bulbs, weighing scale, cleaning materials, black curtains, disinfectants, newspapers, automatic timer switchers, marking pen and notebook.

Seven days before the arrival of the chicks, all equipment were cleaned and disinfected. The brooding-rearing cages were divided to accommodate the three treatments with four replicates. For treatments 1 and 2, sides of the cages were covered with plywood except on the top which were covered with black curtains to ensure that no light penetrate inside. For control treatment cages were all screen. Incandescent bulb was installed in each cage to provide heat to the birds. For treatments 1 and 2, extra sockets for bulb covered black were installed to provide heat during the dark period. It was switched on when the lights were switched off. The floor was covered with newspaper to serve as receptacles during the first two weeks of the experiment. Four hours before the arrival of chicks, lights were switched on to attain uniform warmth inside the cages.

On the 21st day of age, the chicks were randomly distributed into three treatments which were replicated four times with 10 birds per replicate, following the Completely Randomized Design (CRD). The chicks were weighed individually to obtain their initial weight. The treatments were as follows:

T_0 - 23-hour light and 1- hour darkness (cycle for 24 hours)

T_1 - 45-minute light and 15-minute darkness (cycle for 24 hours)

T_2 - 15-minute light and 2-hour darkness (cycle for 24 hours)

For treatment 0, lights were switched off from 8 PM to 9 PM. For treatment 1, lights were intermittently switched on for 45 minutes and then switched off for 15 minutes. For treatment 2, lights were intermittently switched on for 15 minutes and then turned-off for 2 hours. This was a cycle throughout the day throughout the study. All the switching on and off of lights were done by automatic timer switcher.

Ad libitum feeding was employed from the start until the end of the study. Feeders were provided inside the cages during the rest of brooding period. The newspaper mats were removed after 14 days of brooding.

Antibiotics, vitamins and minerals were added to the drinking water following the prescribed dosage throughout the study. Chick booster was given to the chicks up to two weeks of age and then gradually shifted to starter ration on the 15th day and to finisher ration on the 31st day until the end of the study. Shifting of feeds were done by mixing 25% of the new type of feed on the first day, 50% on the second day and 75% on the third day so that on the fourth day, the birds were fed with new type of feed.

Data Gathered:

1. Initial weight of the broilers (kg). This was obtained by weighing the birds individually at the start of the study which was on the 21st day of the broilers.

2. Final weight of the broilers (kg). This was obtained by weighing broilers at the end of the study which was on the 45th day of age.

3. Feed offered (kg). This was the amount of feed given to the broilers in a day.

4. Feed left-over (kg). This was the amount feed left after a day of feeding.

5. Dressed weight (kg). This was the weight of the broilers after being dressed.

6. Number of sick birds. This was obtained by recording the number of birds

that got sick throughout the study.

7. Number of dead birds. This was obtained by recording the number of birds that died throughout the study.

8. Feed cost. This was the purchase cost of feeds at the time of the study.

Data Computed:

1. Average gain in weight of broilers (kg). This was the taking difference between the initial weight and the final weight.

2. Average feed intake of broilers (kg). This was obtained by taking the difference between the feed offered and the feed refused divided by the number of days on trial.

3. Feed conversion ratio (FCR). This was obtained by dividing the total feed intake by the total gain in weight.

4. Feed cost per kilogram gain in weight of broilers (Php). The cost to produce a kilogram body weight was obtained by multiplying the feed conversion ratio by the cost of 1 kg feed.

5. Percentage mortality of the broilers (%). This was the number of dead birds divided by the total population per treatment, and then multiplied by 100.

6. Percentage morbidity of the broilers (%). This was the number of sick birds divided by the total population per treatment, and then multiplied by 100.

7. Return on investment (ROI). This was computed by taking the net incomedivided by the total cost, then multiplied by 100.

Data were analyzed using the analysis of variance appropriate for CRD. Means were compared using DMRT. The carcass data were analyzed using the covariance analysis, with dressed weight as the covariate.

RESULTS AND DISCUSSIONS

Mean Initial and Final Weight (kg)

The initial weight of the birds at 21 days of age is shown in Table 1. Statistical analysis showed no significant differences in the initial weight of the birds between treatments. This indicates that the birds were relatively uniform in weight at the start of the study. The initial weight of birds ranges from 0.43kg to 0.45kg with an average of 0.44kg.

Mean final weight of broilers at the 45 days of age was also shown in Table 1. Analysis of variance revealed no significant differences among treatment means. The final weight of birds with 23-hour light and 1-darkness had 1.48 kg, birds with 45-minute light and 15-minute darkness had 1.40 kg, and birds with 15-minute light and 2-hour darkness had a 1.36 kg.

The observation on the final weight is same with the study of Basalong (2006) and Macliing (2001) who reported that final weight of birds were not affected by the variation in the length of intermittent light and dark period.

Table 1. Mean initial and final weights of broilers

TREATMENTS	INITIAL WEIGHT AT 21 DAY (kg)	FINAL WEIGHT AT 45 DAY (kg)
23-hour light and 1-hour darkness	0.43[a]	1.48[a]
45-minute light and 15-minute darkness	0.44[a]	1.40[a]
15-minute light and 2-hour darkness	0.45[a]	1.36[a]

Means with a common letter(s) are not significantly different at 0.05 level of DMRT.

Mean Total and Average Gain in Weight

The total and average gain in weight of the birds from the 21 days of age to the 45 days of age is shown in Table 2. Statistical analysis revealed significant differences in the total and average daily gain (ADG) in weight of the birds. The ADG of birds subjected to 23-hour light and 1-hour darkness of 0.0420 kg, those subjected to 45-minute light and 15-minute darkness of 0.0385 is significantly higher than those subjected to 15-minute light and 2-hour darkness of 0.0363kg.

The result study of this is the same with the statement of Fronda (1972), that with such continuous lighting, the chicks are enabled to eat continuously and thereby, they grow at a faster rate. Studies have shown however that although lighted birds consumed more feeds, it does not necessarily mean they would weigh more than those on shorter light periods

Table 2.Total and average gain in weight of birds from 21 days to 45 days of age

TREATMENTS	TOTAL GAIN IN WEIGHT (kg)	AVERAGE DAILY GAIN IN WEIGHT (kg)
23-hour light and 1-hour darkness	3.875 [a]	0.0420 [a]
45-minute light and 15-minute darkness	3.2 [ab]	0.0385 [ab]
15-minute light and 2-hour darkness	3.171 [b]	0.0363 [b]

Means with a not common letter(s) are not significantly different at 0.05 level of DMRT.

Mean Average Daily Feed Intake (kg)

Table 3 shows the average feed intake of the broilers from day 21 to day 45. Analysis of variance revealed a highly significant difference in the feed intake of broilers

Table 3. Total and average daily feed intake of broilers from day 21 to day 45

TREATMENT	TOTAL FEED INTAKE (kg)	AVERAGE DAILY FEED INTAKE (kg)
23-hour light and 1-hour darkness	3.88[a]	0.155 [a]
45-minute light and 15-minute darkness	3.2[b]	0.128 [b]
15-minute light and 2-hour darkness	3.71[b]	0.127 [b]

Means with a common letter(s) are not significantly different at 0.01 level of DMRT.

among treatments. Birds subjected to 45-minute light and 15-minute darkness had a total feed intake (TFI) of 3.2kg with an average daily feed intake (ADFI) of 0.128 kg and birds subjected to15-minute light and 2-hour darkness had an TFI of 3.71kgwith an ADFI of 0.127 kg was significantly lower than the TFI (3.88kg) and ADFI (0.155kg) of birds subjected to 23-hour light and 1-hour darkness.

This finding agrees with the observation of Parvu et al., where birds exposed to 23 hours light and 1 hour darkness had total feed intake (TFI) of 3.34 kg, those exposed to 8 cycles of 2 hours light and 1 hour darkness with an TFI of 2.94 kg; birds exposed to 6 cycles of 2 hours light and 2 hours darkness with an TFI of 2.90 kg and birds subjected to 12 hours light and 12 hours darkness had 2.20 kg feed intake with a duration of 49 days that the shorter the period of light the lesser the feed intake.

This shows that light enables the birds to eat continuously. This was showed in the high feed intake of birds with 23-hour light and 1-hour darkness.(Animal Industry Branch, Manitoba Agriculture and Food, 2007).

Feed Conversion Ratio (FCR.

Table 4 shows the feed conversion ratio (FCR) from day 21 to day 45. Analysis of variance revealed that the feed conversion ratios of birds were not significantly different between treatments. This indicates that FCR of birds exposed to 23-hour-light and one hour darkness of a 1.49, those exposed to 45-minute light and 15-minute darkness of 1.34 and those exposed to 15-minute light and 2-hour darkness of 1.39 feed conversion ratios are comparable.

This however disagrees with the study of Ingram and Hatten where birds exposed to 23 hours light and 1 hour darkness had an FCR of 1.96 and birds exposed to 12 hours light and 12 hours darkness with an of 1.93. Birds exposed to 12 hours light and 12 hours darkness was significantly lower than birds exposed to 23 hour light and 1 hour darkness in the FCR. This contrast can be due to the variation in the length of light and dark periods used in the study. Shorter dark period were used in this study.

Table 4. Mean feed conversion ratio of broilers from day 21 to day 45

TREATMENTS	FEED CONVERSION RATIO
23-hour light and 1-hour darkness	1.49[a]
45-minute light and 15- minute darkness	1.34[a]
15-minute light and 2-hour darkness	1.39[a]

Means with a common letter(s) are not significantly different at 0.05 level of DMRT.

Feed Cost per Kilogram Gain in Weight (Php)

Table 5 shows the feed cost per kilogram gain in weight of birds. Analysis of

Table 5. Feed cost per kilogram gain in weight (Php)

TREATMENTS	FEED COST/KG GAIN IN WEIGHT
23-hour light and 1-hour darkness	34.86
45-minute light and 15-minute darkness	31.30
15-minute light and 2-hour darkness	32.64

Means with a common letter(s) are not significantly different at 0.05 level of DMRT.

variance revealed no significant differences among treatments. This indicates that there were not differences in the feed cost among the treatments. Birds subjected to 23-hour light and1-hour darkness had 34.86; birds exposed to 45-minute light and 15-minute darkness had 31.30 and birds exposed to 15-minute light and 2-hour darkness had 32.64 feed cost per kilograms. There were no significant differences because the feed conversions were not significant among treatments.

Mortality and Morbidity of Birds

Mortality and morbidity of birds were not observed in the study. Providing vitamins and minerals not only in the brooding period but until the 35th days of age could help why mortality and morbidity are not observed in the study. And the weather and environment could be a factor too.

Dressing Percentage

The dressing percentage is shown in Table 6. Analysis of variance shows no significant differences between the dressing percentages of broilers. This indicates that the dressing percentage of broilers was not significantly affected by intermittent light.

Table 6. Dressing percentage of 1.5 kg birds

TREATMENT	SLAUGHTER WEIGHT (KG)	DRESSED WEIGHT (KG)	DRESSING %
23-hour light and 1-hour darkness	1.5	1.05	69.99
45-minute light and 15-minute darkness	1.5	1	66.67
15-minute light and 2-hour darkness	1.5	1	66.67

Means with a common letter(s) are not significantly different at 0.05 level of DMRT.

The average the dressing percentage of broilers is 67.78%. The dressed weight of birds excluded thehead, feet and entrails. This differ from the 69 dressing percentage of Ibarra, may due on how the head was cut.

Return on Investment

The return on investment (ROI) of birds subjected to 23-hour light and 1-hour darkness of -21.08% and those subjected to 45-minute light and 15-minute darkness of -16.07 % was significantly lower than the ROI of birds subjected to 15-minute light and 2-hour darkness of -4.93%. This is due to higher feed intake and electric consumption of bird's subjected to longer light periods, thus higher feed and electric costs.

Table 7. Return on investment(%)

TREATMENT	ROI (%)
23-hour light and 1-hour darkness	-31.47
45-minute light and 15-minute darkness	-28.20
15-minute light and 2 hour-darkness	-20.65

SUMMARY, CONCLUSION AND RECOMMENDATION

Summary

This study was conducted to determine the effect of intermittent lighting program on the performance of broilers giving three treatments. Birds were subjected to 3 lighting regimens as follows: 23 hour light and 1 hour darkness as control, cycle of 45 minutes light and 15 minutes darkness, and cycle of 15 minutes light and 2 hours darkness.

Results showed that intermittent light did not affect the final weight of birds at 45 days of age, feed conversion ratio, feed cost per kilogram gain in weight and dressing percentage. The average initial weight of birds at 21 days was 0.44 kg and the final weight of birds at 45 days was 1.411 kg. The average daily gain was 0.04kg with an average feed conversion ratio of 1.407. Feed cost to produce a kg gain in weight was 32.93 pesos and the average dressing percentage was 67.78%. Highly significant differences were observed in the feed intake and gain in weight of birds exposed to longer light period.

Daily gain in weight of birds exposed to 23-hour-light and one hour darkness (0.0420) were significantly higher different on gain in weight with those on shorter light periods on the final weight of birds were mot comparable among treatments. This shows that as the birds are growing, birds with longer light were gaining more weight compared with those of shorter light, but in the final weight they were not significantly different. This result was affected by little differences on the initial weight of birds.

Conclusion

Result of this study showed that exposing broiler birds to intermittent light did not

affect the growth performance of broilers. However the performance of birds subjected to 23-hour light and 1-hour darkness (cycle for 24 hours) and birds subjected to 15-minute light and 2-hour darkness (cycle for 24 hours) are almost the same.

Recommendation

Basing from the result of the study, 45-minute light and 15-minute darkness is recommended.

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APPENDICES

Appendix Table 1. Initial weight of birds (kg)

TREATMENT	REPLICATION				TOTAL	MEAN
	I	II	III	IV		
T0	0.4270	0.433	0.415	0.443	1.718	0.43
T1	0.4410	0.471	0.44	0.419	1.771	0.443
T2	0.4450	0.414	0.459	0.463	1.781	0.445
TOTAL MEAN					5.27	0.44

ANALYSIS OF VARIANCE

SOURCE TABULAR	DEGREE OF FREEDOM	SUMS OF SQUARES	MEAN SQUARES	F	F 0.05	F 0.01	COMPUTED VARIANCE
Treatment	2	0.0006	0.000287	0.7901	4.257	8.022	
Error	9	0.0033	0.00036272				
Total	11	0.0039					CV = 4.34 %

Not significant

Appendix Table 2.Final weight of birds (kg)

TREATMENT	REPLICATION				TOTAL	MEAN
	I	II	III	IV		
T0	1.52	1.51	1.38	1.49	5.9	1.475
T1	1.36	1.35	1.43	1.47	5.61	1.403
T2	1.4	1.27	1.35	1.4	5.42	1.355
TOTAL					16.93	
MEAN						1.411

ANALYSIS OF VARIANCE

SOURCE	DEGREE OF FREEDOM	SUMS OF SQUARES	MEAN OF SQUARES	F	F TABULAR 0.05	F TABULAR 0.01	COMPUTED VARIANCE
Treatment	2	0.0292	0.014608	3.9042	4.257	8.022	
Error	9	0.0337	0.003742				
Total	11	0.0629					CV = 4.34 %

Not significant

Appendix Table 3.Average daily gain in weight (kg)

TREATMENT	REPLICATION				TOTAL	MEAN
	I	II	III	IV		
T0	0.0440	0.0430	0.0390	0.0420	0.1680	0.0420
T1	0.037	0.0350	0.0400	0.0420	0.1540	0.0385
T2	0.0380	0.0340	0.0360	0.0370	0.1450	0.0363
TOTAL					0.47	
MEAN						0.04

ANALYSIS OF VARIANCE

SOURCE	DEGREE OF FREEDOM	SUMS OF SQUARES	MEAN OF SQUARES	F	TABULAR F 0.05	TABULAR F 0.01	COMPUTED VARIANCE
Treatment	2	0.0001	0.000034	5.8406	4.2565		8.0215
Error	9	0.001	0.0000057				
Total	11	0.002					CV = 6.16 %

Highly significant

Appendix Table 4. Total gain in weight (kg)

TREATMENT	REPLICATION				TOTAL	MEAN
	I	II	III	IV		
T0	1.093	1.077	0.965	1.047	4.18	1.05
T1	0.919	0.879	0.990	1.051	3.84	0.96
T2	0.955	0.856	0.891	0.937	3.64	0.91
TOTAL					11.66	
MEAN						0.97

ANALYSIS OF VARIANCE

SOURCE	DEGREE OF FREEDOM	SUMS OF SQUARES	MEAN OF SQUARES	F	F TABULAR 0.05	F TABULAR 0.01	COMPUTED VARIANCE
Treatment	2	0.0377	0.018854	5.1134	4.2565	8.0215	
Error	9	0.0332	0.00368717				
Total	11	0.0709					CV = 6.25 %

Significant

Appendix Table 5. Feed conversion ratio

TREATMENT	REPLICATION				TOTAL	MEAN
	I	II	III	IV		
T1	1.424	1.499	1.608	1.478	5.959	1.49
T2	1.385	1.461	1.287	1.218	5.351	1.338
T3	1.352	1.457	1.411	1.359	5.579	1.395
TOTAL					16.89	
MEAN						1.407

ANALYSIS OF VARIANCE

SOURCE	DEGREE OF FREEDOM	SUMS OF SQUARES	MEAN OF SQUARES	F	TABULAR F 0.05	TABULAR F 0.01	COMPUTED VARIANCE
Treatment	2	0.047171	0.023585	3.4410	4.2565		8.0215
Error	9	0.061688	0.006854				
Total	11	0.108859					CV = 5.88 %

Significant

Appendix Table 6. Dressing percentage

TREATMENT	REPLICATION				TOTAL	MEAN
	I	II	III	IV		
T1	73.33	66.67	66.67	73.3	280	79.99
T2	66.67	66.67	66.67	66.67	266.67	66.67
T3	66.67	66.67`	66.67	66.67	266.67	66.67
TOTAL					813	
MEAN						67.78

ANALYSIS OF VARIANCE

SOURCE	DEGREE OF FREEDOM	SUMS OF SQUARES	MEAN OF SQUARES	F	F	COMPUTED VARIANCE
				TABULAR 0.05	TABULAR 0.01	
Treatment	2	29.43735	14.718675	3.0000	4.2565	8.0215
Error	9	44.156475	4.906275			
Total	11	0.108859				CV = 53.27 %

Not significant

Appendix Table 7. Feed cost per kilogram gain in weight (Php)

TREATMENT	REPLICATION				TOTAL	MEAN
	I	II	III	IV		
T1	33.32	33.91	37.63	34.59	139.4	34.86
T2	32.41	34.19	30.12	28.5	125.2	31.3
T3	31.64	34.09	33.02	31.8	130.5	32.64
TOTAL					395.2	
MEAN						32.93

ANALYSIS OF VARIANCE

SOURCE	DEGREE OF FREEDOM	SUMS OF SQUARES	MEAN OF SQUARES	F	F TABULAR 0.05	F TABULAR 0.01	COMPUTED VARIANCE
Treatment	2	25.82877	12.9143851	3.44	4.2565		8.0215
Error	9	33.77802	3.75311313				
Total	11	59.60689		CV = 5.88 %			

Not significant

Appendix Table 8.Average Daily Feed Intake (kg)

TREATMENT	REPLICATION				TOTAL	MEAN
	I	II	III	IV		
T1	0.1556	0.1561	0.1552	0.1547	0.6216	0.1554
T2	0.1273	0.1284	0.1274	0.128	0.5112	0.1278
T3	0.1292	0.1247	0.1258	0.1273	0.507	0.1267
TOTAL					0.164	
MEAN						0.1366

ANALYSIS OF VARIANCE

SOURCE OF VARIANCE	DEGREE OF FREEDOM	SUMS OF SQUARES	MEAN OF SQUARES	COMPUTED F	TABULAR F 0.05	TABULAR F 0.01
Treatment	2	0.211088	0.10554361	724.38	4.2565	8.0215
Error	9	0.001311	0.0001457			
Total	11	0.212398				CV = 0.88 %

Highly significant

Appendix Table 9. Return on investment

Production costs	T0	T1	T2
Broiler chicks =	1,800	1,800	1,800
Feed cost =	4,697.764	4,058.008	4,025.716
Electricity =	2,112.9492	1,717.7592	472.9107
Vitamins and minerals =	250	250	250
Labor =	2,250	2,250	2,250
Cages =	82.2	82.2	82.2
Total production cost	11,192.9132	10,157.9672	8,880.8267
SALES	– 7,670	– 7,293	– 7047
NETPROFIT	-3,522.9132	- 2,864.9672	- 1,833.8267

*Feed cost: total feed consumed x 1kg feed cost

T0 = 155.46 x 23.4 = 3637.764

T1 = 128.12 x 23.4 = 2998.008

T2 = 126.74 x 23.4 = 2965. 716

*feed cost from day 1-20 = 3180/ 3 = 1060 per treatment

*Labor: 150/ day X 45 days = 6,750/3 = 2,250 per treatment

*Depreciation of cages:

Cage= 10,000 ; Life span+ 10 years

10,000/ 5 years = 2,000/year X 1year/365days = 5.48/day

45 days X 5.48 = 246.6/ 3 = 82.2 per treatment

Electricity

Beneco rate = Php 7.9038 / KWh

*per treatment 400 watt bulbs used

T0 = 23 hr x 25 days = 575 hrs x 400 watt = 230000 watt/hr

230000 watt/ hr x 1 KW/1000watt = 230 KWh

230 KWh x Php 7.9038 /KWh = Php 1817.874

T1 = 18 hr x 25 days = 450hrs x 400 watt = 180000 watt/ hr

180000 watt/hr x 1 KW/ 1000watt = 180 KWh

180 KWh x Php 7.9038 KWh = Php1422.684

T2 = 2hrs and 15 minutes x 25 days = 56.25 hrs x 400 watt = 22500watt/hr

22500watt/hr x 1 KWh/1000 watt = 22.5 KWh

22.5 KWh x Php 7.9038 = Php 177.8355

*from day 1 – 20

24 hrs x 20 days= 280 hrs x 400 watt = 112000 watt / hr

112000 watt/ hr x 1 KWh/ 1000watt = 112KWh

112 KWh x Php 7.9038 = Php 885.2256

*885.2256 / 3 = 295.0752 per treatment