NICK CHICK

White Egg Layers

H&N® INTERNATIONAL

The key to your profit!

Management *Guide*

North American Edition

INTERNATIONAL

The key to your profit

The H&N genetics and health research staffs have worked for many years to produce a layer with excellent production rate, livability, feed conversion, shell quality and egg weight. These traits are the primary factors determining profit for the producer. The goal is to achieve the genetic potential that has been bred into the H&N "NICK CHICK" layer.

The purpose of this manual is to outline those management practices that experience has shown are important to attain optimum performance from the H&N "NICK CHICK" under most conditions. Management recommendations are provided, and, if followed, the producer should achieve the performance goals stated in this manual. Good poultry management is the key to success with H&N "NICK CHICK" layer flocks.

One should never accept average or below average performance. Obtaining optimum performance from each of the birds in the flock helps to produce maximum results. Good flock husbandry requires a little extra effort, but it pays high dividends. Good poultry management is not complicated; it simply requires attention to all of the details of the flock's needs, common sense and proper decision making throughout the flock's lifetime. This management guide will aid you in making correct decisions.

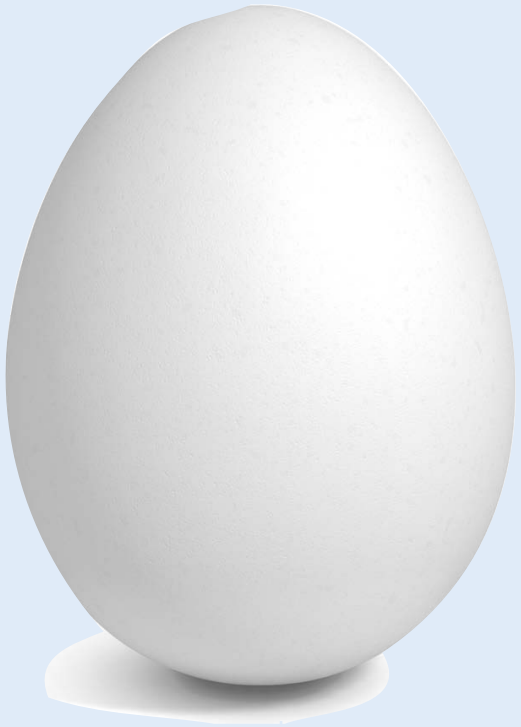

Figure 1: Nick Chick Performance Specifications

Liveability	**0 – 19 weeks: 96 – 98 % 19 – 95 weeks: 90 – 95 %**				
Egg Production	First Cycle				
	Age at 50% Hen-Day Production				140 – 150 Days
	4 wk Peak				94 – 96 %
	Hen-housed Performance to 60 wk			257 eggs	255 – 260 eggs
	Hen-housed Performance to 80 wk			373 eggs	370 – 375 eggs
	Hen-housed Performance to 90 wk			423 eggs	420 – 425 eggs
	Hen-housed Performance to 95 wk			445 eggs	442 – 447 eggs
	Period over 90 %				35 weeks
	Period over 80 %				60 weeks
Feed	Period (weeks)	Conversion (kg Feed / kg Eggs or lbs Feed / lbs Eggs)		Consumption (lbs / 100 / day)	
	19 – 60	1.85		22.00	
	19 – 70	1.83		22.00	
	19 – 80	1.83		22.00	
	19 – 90	1.86		22.00	
	19 – 95	1.88		22.00	
	Period (weeks)	Feed per Dozen Eggs (kg)		Feed per Dozen Eggs (lbs)	
	19 – 60	1.32		2.92	
	19 – 70	1.32		2.92	
	19 – 80	1.34		2.94	
	19 – 90	1.37		3.01	
	19 – 95	1.38		3.05	
Body Size	Age (weeks)	Weight (kg)		Weight (lbs)	
	19	1.329		2.93	
	60	1.666		3.67	
	80	1.705		3.76	
	90	1.715		3.78	
	95	1.720		3.79	
Egg Weight	Age (weeks)	g / Egg	Net.lbs / 30 Doz.	Cumulative Egg Mass (kg/HH)	Cumulative Egg Mass (lbs/HH)
	25	54 – 55	42.9 – 43.7	1.47	3.24
	30	58 – 59	46.0 – 46.8	3.34	7.36
	35	59 – 60	46.8 – 47.6	5.30	11.68
	40	60 – 61	47.6 – 48.4	7.29	16.07
	50	62 – 63	49.2 – 50.0	11.31	24.92
	60	63 – 64	50.0 – 50.8	15.30	33.73
	70	63 – 64	50.0 – 50.8	19.16	42.23
	80	63 – 64	50.0 – 50.8	22.74	50.14
	90	64 – 65	50.8 – 51.6	25.92	57.14
	95	64 – 65	50.8 – 51.6	27.34	60.28

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BROODING AND REARING PROGRAM

Goals of Management

The goal of management is to produce pullets which, at 17 weeks of age, are properly conditioned to make the transition to excellent layers. Proper condition is defined as:

- 2.66 lbs / 1205 grams body weight average
- Minimum uniformity of 85 %
- Healthy and alert
- High resistance to disease as shown by antibody levels

General Preparation

Thoroughly clean equipment and facilities by removing all debris and dust left by the previous flock and by washing with a high pressure washer. Manure should not be stored closer than 1.000 ft. or 300 m from the brooder houses and should not be located upwind. Eliminate rodents, wild birds and other vermin. Make any necessary repairs, and clean and disinfect water lines and tanks. Feed bins, fill systems and feeders must be emptied, cleaned and disinfected.

Isolation and Sanitation

Isolation and restricted access to the brood / grow area are of prime importance for the control and prevention of poultry diseases. The "all-in all-out" brood / grow program is recommended as it provides an excellent means for isolation and allows for proper cleanup in the event of a disease outbreak. Traffic between the brood / grow area and lay houses should be avoided. Brooding and growing houses should not be placed downwind from the layer facilities if they are located on the same farm.

An important part of isolation is keeping poultry houses free of outside birds, rodents and other wildlife because they can be a major source of disease causing agents and parasites. Houses for adult and growing flocks should be separated by a minimum distance of 330 ft. or 100 m. Caretakers should be assigned to one house and should not go back and forth between houses. Managers inspecting flocks should visit the youngest flock first and the oldest last. A foot bath containing fresh, clean disinfectant should be placed at the entrance to each house. The disinfectant solution needs to be checked at least once a day and changed frequently. Allow only essential personnel in and around poultry houses. All vehicles should be disinfected prior to entering the farm. Do not allow drivers of off-farm vehicles to enter any poultry houses. Shower in / shower out facilities are recommended for employees and essential visitors.

Humidity

Humidity is an important aspect of successful brooding. The relative humidity should be maintained between 60 and 70 %. Humid air guarantees a proper heat transfer and an optimum brooding climate. This is important for a good start of the chicks, to support them to reach an optimal body temperature, the bodyweight growth and the development of their immunity. Humidity is usually not a problem after six weeks of age because it is easier to maintain a satisfactory moisture level at lower temperatures and the older, larger bird exhales a considerable amount of moisture into the atmosphere.

Getting Chicks Off to a Good Start

Before the Chicks Arrive:

1. Make sure the correct temperature is being maintained uniformly inside the building.
2. Check the settings of the time clocks and dimmers for the lights.
3. Have automatic feed and water systems checked for proper settings and uniform distribution of feed and water.
4. Trigger nipples and cups to ensure proper working condition and to stimulate drinking by the chicks.
5. Coordinate time of arrival with the hatchery and confirm the number and condition of chicks being delivered.

Electrolytes:

Some producers have found that the addition of electrolytes to the drinking water has improved chick performance. The choice should be made after consulting with a qualified veterinarian who is familiar with local conditions.

Signs of Distress

Be alert to distress signals produced by the chicks. React appropriately to the following chick behavior:

a. Listless and prostrate chicks which indicates excessive heat.
b. Loud chirping indicates hunger or cold.
c. Grouping (huddling) together indicates excessive cold or drafts.
d. Pasted vents which may indicate excessive heat or cold.

Water

Chicks must have access to plenty of clean, fresh water. The drinkiung water temperature for chicks should be set to 70–75 °F (20–25°C). This is necessary for flocks to get off to a good start. Water intake must not be restricted under any conditions. Water consumption rises dramatically with increasing ambient temperature as illustrated in Table 2. If sufficient watering space is not available, or if the watering system or supply is insufficient to meet maximum demand, the growth rate and health of the flock will be impaired.

Feed

An optimal feed for chicks is a very homogenous mash feed supplied ad libitum to the chicks. The starter feed should not contain too coarse particles to avoid crop impactation. If this is not available for the early growth, crumbles are better than a suboptimal mash. Provide plenty of feeder space.

Table 1: Recommended Particle-Size Distribution for Chick Starter, Grower, Developer and Layer Feed (MASH)

Sieve Size	Passing Part	Sieve Size Interval	Part of Interval
0.5 mm	19 %	0–0.5 mm	19 %
1.0 mm	40 %	0.51–1.0 mm	21 %
1.5 mm	75 %	1.01–1.5 mm	35 %
2.0 mm	90 %	1.51–2.0 mm	15 %
2.5 mm	100 %	> 2 mm	10 %
			100 %

Intermittent Lighting Program in Rearing for Day Old Chicks

When the day old chicks arrive on the farm, they have been intensively handled in the hatchery and often had a long transport to their final destination. Common practice is to give them in the first 2 or 3 days after arrival, 24 hours light to help them to recover and to provide those chicks enough time to eat and to drink. In practice it can be observed that after arrival and housing some chicks continue to sleep, others are looking for feed and water. The activity of the flock will always be variable. Especially in this phase, poultrymen have difficulties interpreting the chicks behavior and their condition.

There is a practically proved principal in splitting the day into phases of resting and activity using a specially designed intermittent lighting program. The target is to synchronize the chicks' activities. The caretaker gets a better impression on the flock's condition, the birds are pushed by the group's behavior to search for water and feed.

Therefore, H&N International advises to give chicks a rest after they arrive at the rearing farm and then start with periods of four hours of light and two hours of darkness.

Table 2: Water Consumption of Pullets*

Water Consumed / 1000 birds / day				
Age (Week)	70 °F Gal.	21 °C Liter	90 °F Gal.	32 °C Liter
2	8	30	9	35
4	20	77	31	118
6	27	101	45	169
8	31	118	52	196
10	33	125	57	216
12	35	134	59	224
14	37	139	61	232
16	38	144	63	240
18	39	148	65	246

* M. O. North and D. D. Bell, Commercial Chicken Production Manual, 4th Ed., 1990, pg. 262.

Temperature

The day before the chicks arrive, heat the building to the temperature specified in this guide (Table 3). If the temperature is too low or too high, chicks will react with signs of disstress.

Table 3: Temperature Requirements in the Brooding and Growing Period

Cage	34 °C – 35 °C* / 93 °F – 95 °F	34 °C – 35 °C* / 93 °F – 95 °F
Floor	35 °C – 36 °C* / 95 °F – 97 °F	Reduce 3 °C / 5 °F each week until supplementary heat is no longer needed

* At chick level

House temperatures should be decreased by 5 degrees / week until supplementary heat is no longer required.

Light

Be sure sufficient light intensity, two to three foot candle or 20 to 30 Lux, is provided the first week so that the chicks can easily locate the feed and water.

Air / Ventilation

Supply sufficient volumes of fresh air to remove dust and undesirable gases. Provide movement of air even on cool days. Adequate ventilation is especially important in hot weather.

Body Temperature of Chicks

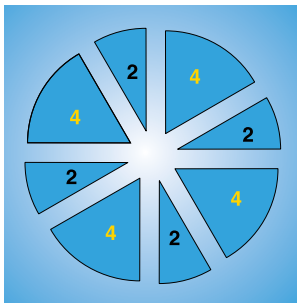
There are findings which confirm that the temperature of chicks is between 40.0 °C and 41.0 °C (104 °F and 106 °F) after the moment of full homeothermy. This information can be used in parallel with the behavior of the housed chicks to adjust house temperatures in an optimal way. Use modern ear thermometers, known from human medicine, as these are useful devices to measure the body temperature of day old chicks.

Make sure that you collect samples of chicks in different parts of the house and control their rectal temperature. Proceed in a way like you normally would do when weighing chicks / pullets and check for uniformity. Obtain samples from chicks distributed throughout the house in order to have reliable readings. Collect the information, calculate the average and adjust the house temperatures accordingly to achieve optimal chick temperatures.

Factors which could result in a drop in the body temperature of chicks and thus causing them to freeze include the following:

- the distribution of air within the house
- a low level of humidity in the house (i.e. heat transfer capacity of the air)
- the house was not pre-warmed in time

Lighting Program after Arrival



- 4 hours light
- 2 hours darkness
- 4 hours light
- 2 hours darkness
- 4 hours light
- 2 hours darkness
- 4 hours light
- 2 hours darkness

This program can be used for up to 7 to 10 days after arrival. Then switch back to the regular step down lighting program. The usage of the above lighting program brings about advantages as follows:

- The chicks are resting or sleeping at the same time. That means that the behavior of the chicks will be synchronized.
- The non active chicks will be stimulated by stronger ones to move as well as to eat and drink.
- The behavior of the flock is more uniform and the assessing flock condition is easier.
- The mortality will decrease.

CAGE BROODING AND GROWING

Water

The proper drinker space (Table 4) must be provided. Water cups must be full when chicks arrive. For the first few days, the cups or nipples should be checked and triggered several times each day. Too often chicks depend on one cup or nipple for their water supply and when it is not working, dehydration sets in fast. The water system should be the same in both the growing and laying houses.

Table 4: Drinker Space Requirements in the Brooding and Growing Periods

	Birds per Hanging Fount	Cups per Cage	Birds per Cup	Nipples per Cage	Birds per Nipple	Amount of Trough per Bird
Cage Brood Grow		2 2	20–24 10–12	2 2	20–24 10–12	1.25 cm*/ 0.5 in.* 1.25 cm*/ 0.5 in.*

* Linear length – length accessible to a bird, one side of trough.

Brooder

Have the brooder house ready and start the heating system 24 hours prior to the arrival of the chicks.

Feed

Start the day old chicks on crinkled paper or newspaper, not slick colored advertisement sheets, laid over the complete wire floor. It is imperative, that the paper covers the floor under the drinkers too. Place it so chicks can walk right up to the feed and water. A small amount of high quality feed placed on the paper floor or feed trays and having the feed trough as full as possible will also help get the chicks off to a good start. Be sure that there is sufficient feeder space (Table 5) to assure proper growth and uniformity.

Table 5: Feeder Space Requirements in the Brooding and Growing Periods

Cage	
Brood / Grow	5 cm / 2 in. / bird

Coccidiosis Control

In cage rearing a proper management of the the paper is important, if the chicks are vaccinated.
Chick papers should be left long enough in the cages, at least for three oocyst cycles.

Floor (Cage) Space

Most cage systems are designed so that one-third to one-half of the cage area is used for brooding. In order to assure uniformly grown pullets, it is important that the birds be moved into the empty cages at the appropriate time and proper cage density (Table 6).

Table 6: Floor Space Requirements in the Brooding and Growing Periods

Cage	
Brood	142 sq. cm / 22 sq. in. / bird
Grow	284 sq. cm / 44 sq. in. / bird

BEAK TREATMENT

Beak treatment is one of the most important aspects of poultry management, especially in open-type houses with high levels of light. While various methods of beak treatment may be used, the objective is to treat the beak in a uniform manner that will permanently retard future beak growth. Improper beak treatment procedures may result in permanent damage to overall flock performance.

Since pullets are reaching sexual maturity at an earlier age, it is best to beak treat at a young age. This will allow sufficient time for the pullets to recover from any body weight loss that may occur. For this reason any beak treatment after 10 days is not recommended. Later beak treatment in extremely hot weather may result in excessive bleeding. Add Vitamin K to the diet or drinking water a few days before and after the beaks are treated to help prevent excessive bleeding.

After beak treatment it is recommended to increase the house temperature (7–10 days treatment), to increase the feed level in the troughs and to reduce the water pressure in the nipple drinker lines. The use of so called 360° nipples is recommended.

Infra-Red Beak Treatment of Day Old Chicks

With the latest developed techniques (infrared technology) beak treatment already can be applied to day old chicks in the hatchery. It is recommended to treat the chicks with an intensity setting of 47–50, adjusted to the age of the PS flock and the chick size.

7–10 Days Beak Treatment

Beak treatment should be done between 7 and 10 days of age. A precision beak treatment with a hot blade should be done with a guide with three different sized holes (3.5 mm/9/64", 4.0 mm/5/32" and 4.3 mm/11/64") attached to the beak treatment machine. The upper and lower beaks are treated at the same time using the guide hole that will result in the beak being treated and cauterized to the width of a nickel (2 mm) from the end of the nostril. It may be necessary to increase the hole sizes slightly, especially on older chicks, to ensure the correct beak length. The beak should be treated carefully and precisely and cauterized for one second. The beak will not be cut and cauterized properly unless the blade is heated to a dull red (1.100 °F or approximately 590 °C – 595 °C).

Prior to the beak treatment operation, all equipment, including the beak treatment machine, should be thoroughly cleaned and disinfected. It is important that the beak treatment machines are properly adjusted and working correctly. Blades should be changed according to the manufacturers recommendations. Dull blades will crush and tear the beak rather than cutting cleanly through it. The quality of the beak treatment operation will depend on the care and maintenance of the equipment used. Correct maintenance of beak treatment equipment is as important as monitoring the treatment procedures.

FEEDING PULLETS

The H&N "Nick Chick" will grow and develop properly on feeding programs and diets provided by various feed suppliers. The recommended nutrient levels in Table 7 are necessary to produce a pullet with good skeletal and muscular development. The birds should carry a minimum of fat since excess fat may be detrimental to the performance of the pullets. Birds reared in cages may require a slightly different feeding program than birds grown on the floor. Pullets in cages get less exercise and are, maybe, heavier than floor-raised birds.

Brood / Grow

Four diets (Starter, Grower, Developer and Pre-lay in Table 2) during the brood / grow period are very adequate for the H&N "Nick Chick". Each diet should be supplemented with vitamins and minerals as indicated in Table 4. Each diet should be fed until the appropriate target weight listed in this guide is achieved. At that point the next diet should be fed.

Table 7: Recommended Nutrient Density in the Brood / Grow / Pre-lay Diets

Nutrient	Diet type			
	Starter*	Grower	Developer	Pre-lay
Energy (kcal / kg**) Energy (kcal / lb**)	2925 1325	2865 1300	2865 1300	2865 1300
Protein (%)	19.0–20.0	17.5–18.5	14.5–15.5	16.5–17.5
Methionine (%)	0.48	0.40	0.34	0.36
Dig. Methionine (%)	0.39	0.33	0.28	0.29
Met. + Cystine (%)	0.83	0.70	0.60	0.68
Dig. Met. / Cys. (%)	0.68	0.57	0.50	0.56
Lysine (%)	1.20	1.00	0.70	0.85
Dig. Lysine (%)	0.98	0.82	0.57	0.70
Threonine (%)	0.80	0.70	0.50	0.60
Dig. Threonine (%)	0.65	0.57	0.40	0.49
Tryptophan (%)	0.23	0.21	0.16	0.20
Dig. Tryptophan (%)	0.19	0.17	0.13	0.16
Valin (%)	0.89	0.75	0.53	0.64
Dig. Valin (%)	0.76	0.64	0.46	0.55
Isoleucine (%)	0.83	0.75	0.60	0.74
Dig. Isoleucine (%)	0.68	0.62	0.50	0.61
Calcium (%)	1.05	1.00	0.90	2.0–2.3
Phosph. tot.*** (%)	0.75	0.70	0.58	0.65
Phosphorus av.*** (%)	0.48	0.45	0.37	0.45
Sodium (%)	0.18	0.17	0.16	0.16
Chlorine (%)	0.20	0.19	0.16	0.16
Linoleic Acid (%)	2.00	1.40	1.00	1.00

* Chick Starter should be supplied if the body weight standard cannot be achieved by feeding grower or the feed intake is expected to be low.
** rounded to nearest 5 kcal
*** without phytase

Correct Use of Pre-lay Feed

Proper development of medullary bone is critical for calcium metabolism and affects a layer's ability to utilize calcium for her entire life. Because medullary bone development starts two weeks before the onset of production, it is necessary to increase the calcium level of the feed at that time to insure the bird's well-being and the long-term shell integrity of the flock.

Pre-lay feed typically contains 2.0% to 2.5% calcium and is fed for 10 days before the flock is put on a layer ration. Start feeding a pre-lay when the flock reaches 17 weeks of age. Be sure to watch the feed inventory during this time to insure the flock is actually consuming the pre-lay ration by 17 weeks. This process is simple if the flock is moved to the layer house at 17 weeks but requires particular attention if the flock is moved at a different time.

Feed 1.75 lb./bird of the pre-lay ration. At normal consumption levels, this will last for about 10 days. At that time the ration should be changed to a phase I layer feed (see Table 15).

Table 8: Recommended Vitamin and Mineral Additions to the Finished Diets

Supplements per kg Feed		Feeding Program		
		Developer Feed	Followed by	Pre-lay Feed
Vitamin A	IU	12000	12000	10000
Vitamin D_3	IU	2000	2000	2500
Vitamin E	IU	20–30**	20–30**	15–30**
Vitamin K_3	mg	3***	3***	3***
Vitamin B_1	mg	1	1	1
Vitamin B_2	mg	6	6	4
Vitamin B_6	mg	3	3	3
Vitamin B_{12}	mcg	20	20	25
Pantothenic Acid	mg	8	8	10
Nicotinic Acid	mg	30	30	30
Folic Acid	mg	1.0	1.0	0.5
Biotin	mcg	50	50	50
Cholin	mg	300	300	400
antioxidant	mg	100–150**	100–150**	100–150**
Manganese*	mg	100	100	100
Zinc*	mg	60	60	60
Iron	mg	25	25	25
Copper*	mg	5	5	5
Iodine	mg	0.5	0.5	0.5
Selenium*	mg	0.2	0.2	0.2

* So called "organic sources" should be considered with higher bioavailability.
** according to fat addition
*** double in case of heat treated feed

The above values should be reviewed by a nutritionist who is knowledgeable of local conditions (e.g. chemical composition of available ingredients).

Feed Consumption

The data of Table 9 show expected feed consumption. Of course, these values will differ slightly due to the variation in the feed consumption because of environmental conditions.

Feed Quality

Use only fresh feed that is free from chemical and microbial contaminants. Take an appropriate sample of every load of each ingredient if the operation has its own feed mill. If the operation does not have its own feed mill a sample of each load of mixed feed should be taken. Store these samples for several weeks and then discard them if a laboratory analysis is not necessary.

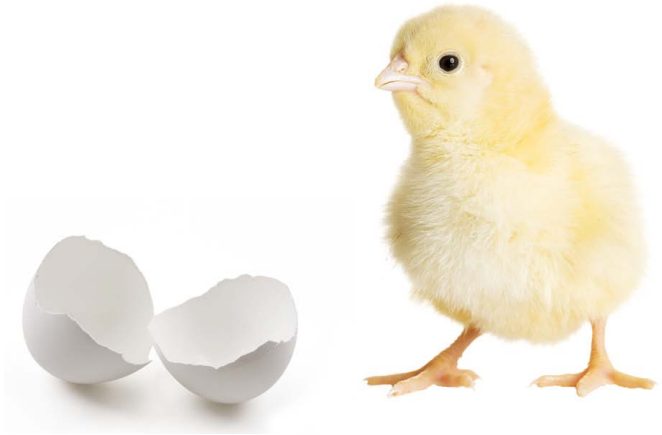
Table 9: Pullet Feed Consumption

High Energy Level // US					
Diet	Week of Life	g/day	lbs/100+day	cumul. (g/bird)	cumul. (lbs/bird)
Starter	1	10	2	70	0.15
	2	17	4	189	0.42
	3	23	5	350	0.77
	4	27	6	546	1.20
Grower	5	31	7	776	1.71
	6	35	8	1033	2.28
	7	39	9	1317	2.90
	8	43	9	1628	3.59
Developer	9	46	10	1960	4.32
	10	50	11	2311	5.10
	11	54	12	2683	5.92
	12	58	13	3075	6.78
	13	62	14	3488	7.69
	14	66	14	3921	8.64
	15	69	15	4374	9.64
	16	74	16	4854	10.70
	17	77	17	5361	11.82
Pre-lay	18	81	18	5895	13.00
	19	85	19	6450	14.22
	20	89	20	7038	15.52

PULLETS BODY WEIGHT

Monitor body weight every one to two weeks during the four to 18 week age range, so that feeding programs can be altered if flocks are not maturing properly. A ten gram increment scale is suggested. A representative sample of one percent of the flock, or a minimum of about 100 birds taken throughout the house, should be weighed each time flock weights are checked. This should be done by weighing each pullet caught in a catching panel from several areas of the house, or by weighing all birds individually in a cage from several areas of the house. Reweigh the pullets immediately if the average body weight is suspect (e.g. higher or lower than expected).

Check the average weight of the sample against the "Nick Chick" body weight guide (Table 11). If optimum performance is to be reached, pullet body weight must closely conform to the H&N guide. It is important with today's "Nick Chick" that the average body weight at 17 weeks be 2.66 lb or 1205 grams. The growth pattern should follow that shown in Table 10.



Uniformity

Body weight uniformity should be calculated after weighing the birds. Ideally at least 85% of the birds should weigh within 10% of the average during growing. After 17 weeks of age the flock will normally become less uniform because of rapid weight gain as individual birds mature at different rates. The use of scales measuring in tenths of an ounce (or one gram) increments are preferable. Scales graduated in larger increments can produce a false indication of uniformity.

The proper procedure for determining flock uniformity is as follows:

1. Calculate the average body weight.
2. Calculate 10 percent of the average weight of the sample.
3. Add and subtract this figure from the average weight to determine the upper and lower values of the uniformity range.
4. Count the number of birds that fall within the range.
5. Divide this number by the total number weighed and multiply by 100. This equals the percent uniformity.

Example:

- Number of birds weighed = 150
- Average (mean) body weight = 1.120 kg
- 10% of the average body weight = 10% × 1.120 kg = 0.1120 kg
- Upper body weight range = 1.120 kg + 0.1120 kg = 1.232 kg
- Lower body weight range = 1.120 kg - 0.1120 kg = 1.008 kg
- Count the number of weighed birds with a body weight between the upper and lower body weight range = 132
- Body weight uniformity = (132 birds in weight range/150 birds weighed) × 100 = 88%

Changing Diets

If the pullets' body weight is on target for their age then change diets as specified in Tables 7 and 9. If the flock is underweight, postpone any scheduled diet changes (e.g. from starter to grower) until the flock reaches its correct weight for its age. Measures to increase growth rate may be needed. For example, birds can remain on the starter diet for a longer period of time to achieve the desired body weight.

Body Weight Gain

If a flock is not reaching target body weights, check the feed and water consumption rate as well as feeder, drinker and floor space. Inadequate cage space can cause a reduction in feed consumption. If the problem persists, do not rule out the possibility of an error in feed delivery. If the water is contaminated or has off flavors, water consumption will decrease followed by a decrease in feed consumption.

Disease may also be an important factor in reduced body weight. If a disease problem is suspected, get an accurate diagnosis of the problem as soon as possible. Always use experienced crews to beak treat birds. Improper beak treatment is very detrimental to the maintenance of correct body weights. Maintain temperatures in which the birds will be comfortable – generally 64 °F to 75 °F or 18 °C to 24 °C, if possible.

Table 10: Recommended "Nick Chick" Body Weight during the Brooding and Growing Periods

Age		Body Weight Goal	
Week	Day	lbs	(g)
1	7	0.14	65
2	14	0.26	120
3	21	0.39	175
4	28	0.54	245
5	35	0.72	325
6	42	0.88	400
7	49	1.10	500
8	56	1.30	590
9	63	1.47	665
10	70	1.64	745
11	77	1.82	825
12	84	1.98	900
13	91	2.12	960
14	98	2.27	1030
15	105	2.39	1085
16	112	2.52	1145
17	119	2.66	1205
18	126	2.81	1275

Table 11: Recommended "Nick Chick" Body Weight during the Brooding and Growing Period / Intermediate Days

Age in Weeks	Body Weight				Average Grams per Bird on Intermediate Day					
	average in g	range in g	average in lb	range in lb	1	2	3	4	5	6
1	65	62–68	0.14	0.14–0.15	73	81	89	96	104	112
2	120	115–125	0.26	0.25–0.28	128	136	144	151	159	167
3	175	168–182	0.39	0.37–0.40	185	195	205	215	225	235
4	245	235–255	0.54	0.52–0.56	256	268	279	291	302	314
5	325	312–338	0.72	0.69–0.75	336	346	357	368	379	389
6	400	384–416	0.88	0.85–0.92	414	429	443	457	471	486
7	500	480–520	1.10	1.06–1.15	513	526	539	551	564	577
8	590	566–614	1.30	1.25–1.35	601	611	622	633	644	654
9	665	638–692	1.47	1.41–1.52	676	688	699	711	722	734
10	745	715–775	1.64	1.58–1.71	756	768	779	791	802	814
11	825	792–858	1.82	1.75–1.89	836	846	857	868	879	889
12	900	864–936	1.98	1.90–2.06	909	917	926	934	943	951
13	960	922–998	2.12	2.03–2.20	970	980	990	1000	1010	1020
14	1030	989–1071	2.27	2.18–2.36	1038	1046	1054	1061	1069	1077
15	1085	1042–1128	2.39	2.30–2.49	1094	1102	1111	1119	1128	1136
16	1145	1099–1191	2.52	2.42–2.63	1154	1162	1171	1179	1188	1196
17	1205	1157–1253	2.66	2.55–2.76	1215	1225	1235	1245	1255	1265
18	1275	1224–1326	2.81	2.70–2.92	1283	1290	1298	1306	1314	1321
19	1329	1276–1382	2.93	2.81–3.05	1338	1348	1357	1366	1375	1385
20	1394	1338–1450	3.07	2.95–3.20	1400	1407	1413	1420	1426	1433

VACCINATION AND DISEASE PREVENTION

Vaccination programs vary with the area, disease exposure, strain and virulence of the pathogen involved and must be designed to meet the needs of the particular local conditions. Competent poultry veterinarians should be consulted regularly for revisions of vaccination and medication programs as well as for disease preventive management practices. Medication practices such as the use of antibiotics and coccidiostats in the feed should also be under the direction of a veterinarian with special training and experience in avian pathology.

General Principles

Some helpful tips for vaccination programs in any location are:

- **Record the following information for permanent flock records:** The vaccine manufacturer, the serial number and expiration date, the date of vaccination, method, reaction observed (if any) and any medication currently in use, signed by the person doing vaccination.
- **Vaccinate only healthy chickens.** If the flock is unhealthy or under stress from any cause, delay the vaccination until the flock has recovered.
- **Do not dilute or "cut" the vaccine.** The weakened vaccine may fail to stimulate adequate immune response in the birds. Be sure that vaccines are not out-dated, that they have been stored and handled properly and that all vaccinating equipment has been thoroughly cleaned and dried before storing.
- **For water vaccination, add powdered skim milk** to the water at the rate of 10 lb / 500 gal. or 2.4 kg / 1000 liters or 0.3 oz. / gal. or 2.4 g / liter before adding the vaccine. This will help to neutralize chlorine, heavy metals, acidity or alkalinity in the water supply which might destroy the virus in the vaccine and reduce potency. When vaccine is to be administered via a proportioner, the quantity of milk must be adjusted to facilitate trouble-free functioning of the proportioner and good distribution of vaccine to all birds. Several vaccine producers offer also colored stabilizers which can be used instead of skim milk during vaccination.
- **Follow manufacturer's directions** regarding the administration of vaccines. Although many vaccines can be given through the drinking water or by spray, specific recommendations vary among companies. Considerations regarding spray particle size, mixing of vaccines, combining of different vaccines, strains and environmental vaccination constraints are viewed differently among the various manufacturers. Typically, the vaccine companies are the best source of information regarding their products.
- **Avoid the use of antibiotics** for three days preceding and at least one week after vaccination with live bacterial vaccines (e.g. Salmonella). Medication with Vitamins two days before and at day of vaccination may improve the general condition of the birds and improve the immune response to vaccination.
- **Depriving the birds of water** for one to two hours prior to water vaccination will help ensure all birds get exposure to the vaccine. Ideally vaccination should be done in the morning to avoid water deprivation during the warmer parts of the day.
- **Water lines should be drained** prior to water vaccination to ensure uniform distribution of vaccine to all birds. Dyes are commonly added to trace the vaccine through the water system and help mark the birds and assess the vaccination process. Dyes are sometimes supplied by the vaccine companies upon request.

Use of Vector Vaccines

There are more and more vector vaccines available in the market. They are using either the Herpes Virus of Turkeys (HVT) or the Pox virus as a carrier to stimulate the immune response to other pathogens like Gumboro, ILT or Newcastle Disease.

Vector vaccines do not cause vaccine reactions as with other live respiratory vaccine viruses. But it is important that HVT vectors should not be used in combination with any other live HVT vaccines.

Serological Monitoring

Serological data obtained after the bulk of the vaccination program is complete by 17 or 18 weeks of age is a good method for evaluating the immune status of a flock of pullets prior to production. Such data also serves as an immune status baseline

for determining whether a field infection has occurred when production drops are observed. It is recommended that the flock owner submit 25 good serum samples to a laboratory one or two weeks prior to the pullets being placed in the lay house to establish freedom from certain diseases such as Mycoplasma gallisepticum (Mg) and Mycoplasma synoviae (Ms) prior to onset of production. Serological data can give valuable information on the immune titer levels for a number of disease causing agents. Working with a poultry laboratory to set up a profiling system will make better evaluations of vaccination programs and flock conditions possible.

Vaccination Programs

Specific recommendations for individual farms are not possible, but the sample vaccination program (Table 12) is intended as a very general guideline for vaccinations which are needed on most farms. Additional vaccinations for coccidiosis, Mg, coryza, and the variant strains of other disease causing agents may also be needed. These decisions, however, need to be made on a farm-by-farm basis after careful consideration of risk factors involved which include but are not limited to: previous exposure, geographic location, vaccination and exposure of neighboring flocks, state regulations and endemic disease causing factors.

Table 12: Sample Vaccination Program

Age	Type
Hatch Day	Marek's Disease Infectious Bronchitis (IB)
14 – 28 days (2 – 4 weeks)	Infectious Bursal Disease (Gumboro) (IBD) Newcastle Disease (NCD) Infectious Bronchitis (IB)
56 – 84 days (8 – 12 weeks)	Fowl Pox Avian Encephalomyelitis (AE) (Epidemic Tremors) Infectious Bronchitis (IB) Newcastle Disease (NCD) Infectious Laryngotracheitis (ILT)
119 – 126 days (17 – 18 weeks)	Submit Serum Samples

Growing Cycle Records

Good growing flock records will allow you to instantly evaluate the condition and progress of each flock. Therefore, good record keeping is a very valuable management tool. Figures for mortality, feed consumption and water intake should be recorded daily and summarized weekly. Body weights and body weight uniformity percentages should also be included in the records of each flock.

All results should be graphed. Use of graphs will improve analyses of flock growth and mortality trends. Notes indicating vaccinations, beak treatment, medication, lighting changes and other significant events should be included in your growing records. Always keep in mind that accurate counts of the number of birds present in the flock are very important.

LIGHTING PROGRAM TO 17 WEEKS

Light control is an extremely important aspect of overall grow and lay flock management. By controlling the daily photo period with artificial light, the egg producer can place flocks and bring them into production at the proper age at any time of the year. Proper light management is a valuable tool for the control of sexual maturity, body weight and egg weight.

The "Nick Chick" will perform under many different lighting programs and the best one depends on the exact needs of each egg producer (e.g. early eggs, early housing, late housing, egg size demands). However, the program that has been found to give the most consistent results is the constant daylength program. Some of the successful lighting programs that are now in use are described below.

First Two Weeks

The lighting program for all flocks in all types of housing is the same the first two weeks. The first two days, chicks should be given 24 hours of light each day at the light intensity of three footcandles or 30 Lux. On day 3, reduce the duration of the light to 16 hours per day and maintain the intensity at 0.5 – 0.75 footcandle or 5 – 7.5 Lux or run an intermittent lighting program as shown on page 11.

Standard Lighting Program for Closed Houses

Light intensity should be as shown in Table 13.

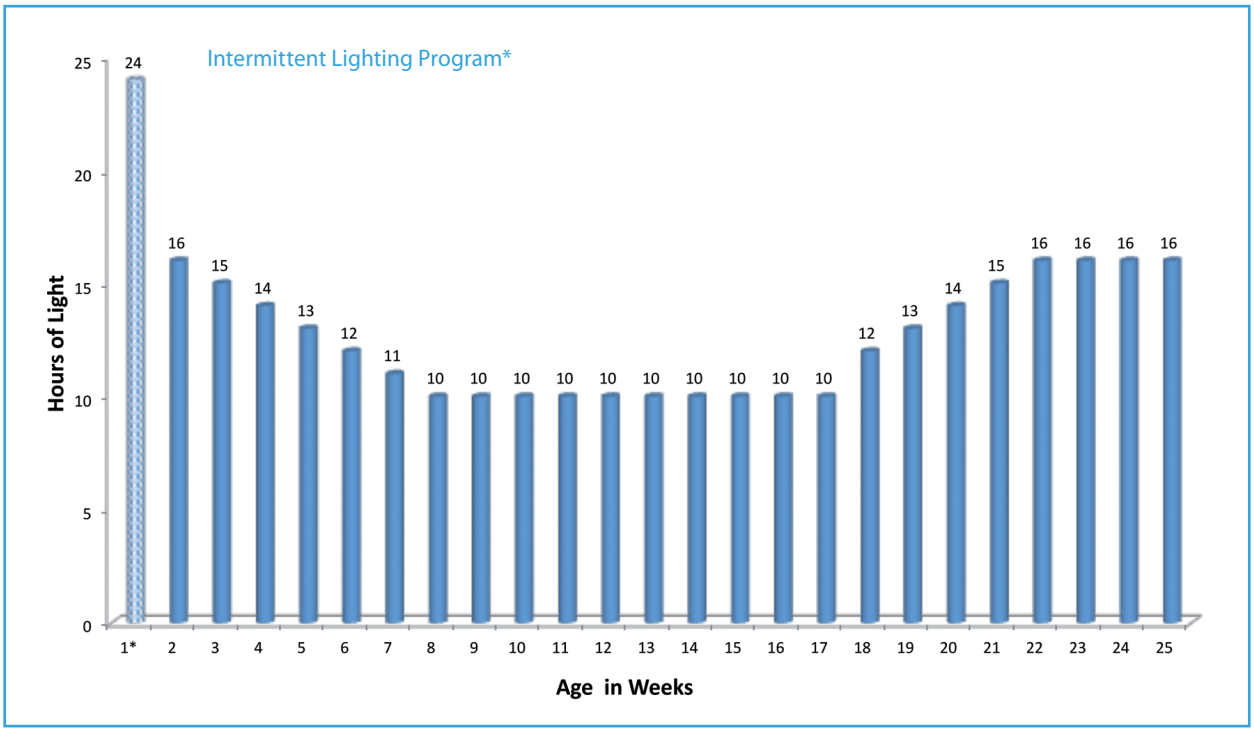


Table 13: Minimum Light Intensity

Age		Footcandle	Lux
Week	Days		
0 – 2	1 – 14	3	30
2 – 17	15 – 119	$^1/_2$	10 – 20
17 until End of Lay	119 until End of Lay	1	10

Brooding and Growing in Open or Brown-out Type Housing

Brooding Latitude 30 Degrees and Up

(Brooding Latitude greater than 30°N or 30°S)

Tailoring the lighting scheme to a specific flock depends on the type of housing and the month when the chicks were hatched.

In open houses, or in houses that have light infiltrating around vents, the lighting program from 15 days of age to housing is dependent on the hatch date. Flocks hatched between February 15 and May 15 need to be given artificial light so that the natural daylength (Table 14) plus the artificial light gives a total daily duration equivalent to the longest natural day from 15 days of age to June 21. This daily light interval is maintained from day 15 until June 21. On June 21, the artificial daylength needs to be changed to the length of the natural day at the time the flock reaches 17 weeks of age (Table 8). At 15 days of age, the artificial daylength for flocks hatched between May 16 and February 14, needs to be set equal to the natural daylength at 17 weeks of age. When determining the daily length of natural light from sunrise and sunset tables, be sure to add an amount (e.g. one hour) to include twilight at dawn and dusk.

For open houses in the southern hemisphere, the above mentioned calendar dates need to be shifted six months.

Lights should go off at the same time in the evening, if physically possible, throughout the growing period – approximately one-half hour after sunset. Such a program provides additional light during the coolest part of the day in order to stimulate feed consumption. At the same time, it provides greater control of sexual maturity that comes from decreasing daylength.

Brooding Latitude 0 to 30 Degrees

(Brooding between 30°N and 30°S)

Latitudes within 30 degrees of the equator have nearly equal periods of daylight and darkness throughout the year and may have small seasonal variations in high ambient temperatures. These present a special problem for the light control program. Managers in such areas need to consider the amount of natural daylight and the amount of light needed to produce maximum production, and they also need to consider adding light during the coolest part of the day to stimulate feed consumption.

The program H&N recommends for flocks placed in latitudes between 0 and 30 degrees north or south regardless of the type of housing, combines both constant and step-down programs.

At 15 days of age, the total daylength needs to be adjusted to 14 hours of light. Most of the artificial light should be given during the early morning hours. Between nine and 11 weeks of age, the step-down phase of the lighting program needs to be initiated if the natural daylength at 17 weeks of age is less than 14 hours. The change in artificial daylength is dependent on the natural daylength at 17 weeks of age. The objective is to reduce the total hours at nine weeks of age (14 hours) to the natural daylength at 17 weeks of age in a manner that will delay sexual maturity. The recommended changes are outlined in Table 8.

LIGHT CONTROL DURING LAY

Pullets grown under good light control require a sharp increase in light to stimulate rapid reproductive development. When the flock is 17 weeks of age and at the proper body weight, the length of day needs to be increased. As a rule of thumb, the first light stimulation should be given when pullets bodyweight is at 2.75 lbs but not earlier than 17 weeks. The result must be 12 hours or more. Additional stimulations of one hour per week need to be given to increase the total hours of light to 16 hours.

Due to the normal high ambient temperatures in some regions, the lights for the lay period should be set to come on at 3:30 a.m. (03.30 hours) and to go off at 7:30 p.m. (19.30 hours). This schedule allows for feed consumption in the coolest hours of the day, even during the warmest times of the year.

Use of intermittent lighting programs is acceptable for flocks over 40 weeks of age in light tight houses.

Giving a dark period between the first artificial light in the morning and natural light will allow maximum performance in open-sided houses. The same is true in the evening when a period of darkness can be allowed before the final artificial light is given.

Table 14: Hours between Sunrise and Sunset in the Northern and Southern Hemispheres

Northern date	0°	10°	20°	30°	40°	50°	Southern date
	H M	H M	H M	H M	H M	H M	
5-Jan	12 7	11 34	10 59	10 17	9 27	8 14	5-Jul
20-Jan	12 7	11 38	11 5	10 31	9 47	8 45	20-Jul
5-Feb	12 7	11 44	11 19	10 52	10 19	9 32	5-Aug
20-Feb	12 6	11 50	11 35	11 16	10 55	10 23	20-Aug
5-Mar	12 6	11 58	11 49	11 38	11 28	11 11	5-Sep
20-Mar	12 6	12 7	12 6	12 6	12 7	12 9	20-Sep
5-Apr	12 6	12 14	12 25	12 35	12 49	13 8	5-Oct
20-Apr	12 6	12 24	12 41	13 2	13 27	14 3	20-Oct
5-May	12 7	12 31	12 56	13 26	14 2	14 54	5-Nov
20-May	12 7	12 37	13 8	13 45	14 32	15 37	20-Nov
5-Jun	12 7	12 41	13 17	14 0	14 53	16 9	5-Dec
20-Jun	12 7	12 42	13 20	14 5	15 1	16 22	20-Dec
5-Jul	12 7	12 41	13 19	14 1	14 55	16 14	5-Jan
20-Jul	12 7	12 37	13 11	13 49	14 38	15 46	20-Jan
5-Aug	12 7	12 32	12 59	13 29	14 9	15 2	5-Feb
20-Aug	12 6	12 25	12 44	13 6	13 35	14 14	20-Feb
5-Sep	12 6	12 17	12 26	12 40	12 55	13 16	5-Mar
20-Sep	12 6	12 8	12 10	12 13	12 16	12 22	20-Mar
5-Oct	12 7	12 1	11 53	11 46	11 37	11 26	5-Apr
20-Oct	12 7	11 52	11 36	11 20	10 59	10 31	20-Apr
5-Nov	12 7	11 44	11 20	10 55	10 21	9 36	5-May
20-Nov	12 7	11 38	11 7	10 34	9 51	8 51	20-May
5-Dec	12 7	11 35	10 59	10 19	9 29	8 18	5-Jun
20-Dec	12 7	11 33	10 55	10 13	9 20	8 5	20-Jun

LIGHTING INTENSITY DURING LAY

Light intensity is an important aspect of a lighting program. With the proper types of controls, light intensity can be adjusted. Low intensity lights reduce power consumption.

Little or no harm will be done if light intensity is increased for short periods of time when the caretaker needs bright light in the houses. The H&N "Nick Chick" also reacts very well to the stimulation of the increase in light intensity at 17 weeks of age. A minimum of one footcandle or 10 Lux should be maintained in the lay house. When the flock is moved to the lay house, the light intensity should be at least equal to the light intensity in the brooder house.

MOVING TO LAY

Preparation

Remove feed for a few hours but continue to provide water. Have clean, disinfected trucks, crates and other equipment. The people who move the birds should wear clean clothing and footwear that have not been exposed to poultry. Be sure all equipment is in good condition so that nothing such as protruding wires or sharp edges will injure the birds.

Loading

Load at a rate that does not force personnel to take short cuts. Continue to ventilate the house. Do not overstuff the carts. Catch and hold the birds by both shanks not the wings.

Transport

The flock should be moved to the lay house as quickly as possible with no unnecessary stops. Keep the sides of the trucks completely open in warm weather and do not completely close in cold weather.

Caging

As the birds are moved from the truck to the lay cages the birds should be carried by both shanks. Ensure that the flock is distributed evenly throughout the house.

LAYING PROGRAM

Housing Birds

The "all-in all-out" housing system is recommended because it helps break the disease cycles which so often accompany a continuous multiple age replacement system. Pullets should be moved to thoroughly cleaned and disinfected laying houses before 18 weeks of age.

Equipment

Each pullet should be provided with at least 54 sq. in./350 sq. cm of cage space at 18 weeks of age and throughout the lay cycle. This is a compromise between maximum performance and the economics of facility cost.

Egg producers on the United Egg Producers (UEP) Certified Care Program are required to provide considerably more cage space. Please check current UEP Certified Care requirements. Since 2008, a minimum of 67 sq. in. or 432 sq. cm of cage space is required. Those egg producers supplying certain foodservice companies may have to provide even more cage space.

Maximum egg production and egg size require that ample feed and water space be provided. Cages should be designed to allow each bird a minimum of 4 in. or 10 cm of access to the feed trough. Provide a minimum of 2 nipples per cage.

Temperature Control

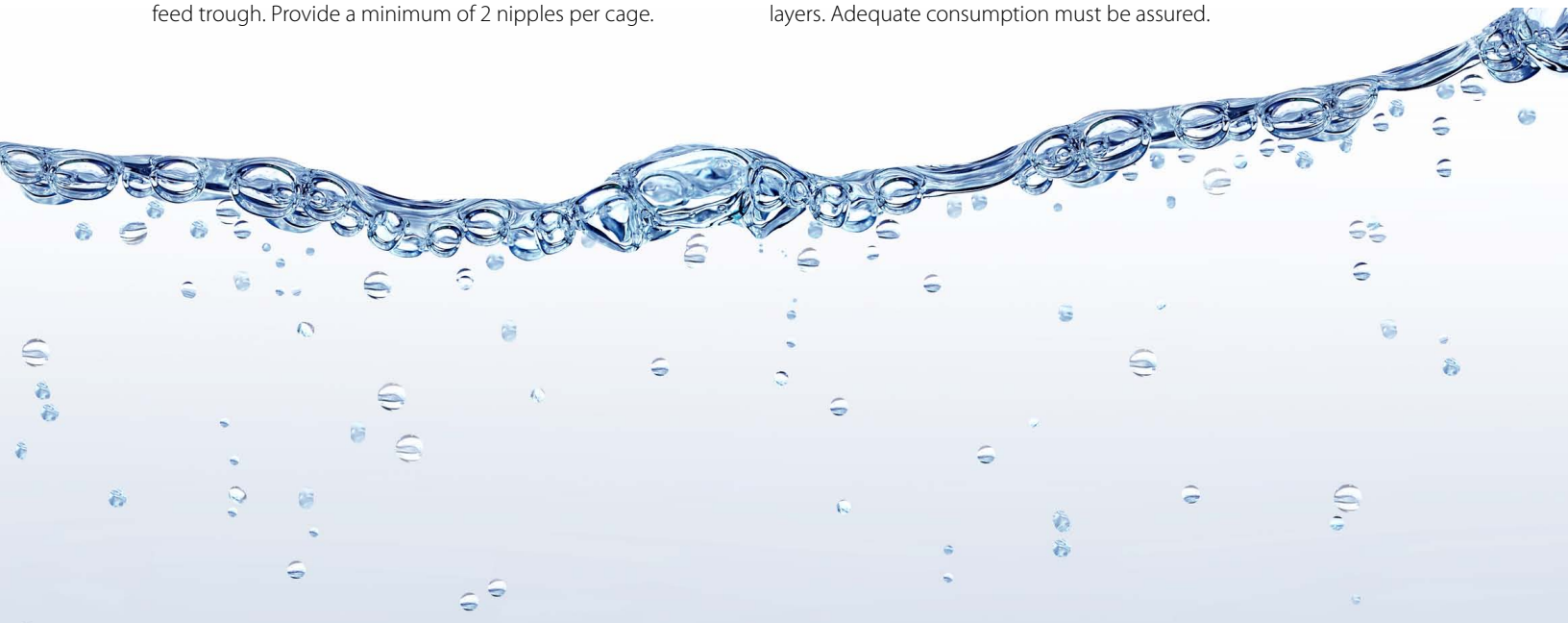
Laying hens perform well over a wide range of temperatures. Temperature changes between 70 °F and 81 °F or 21 °C and 27 °C have a minimal effect on egg production, egg size and shell quality. Feed conversion decreases with higher house temperatures, and maximum efficiency is attained in the 70 °F – 81 °F or 21 °C – 27 °C range. As temperature rises, however, feed consumption decreases and it is necessary to provide a properly fortified diet to achieve adequate daily nutrient intake in a warm house (see section "Feeding in the Lay Cycle").

When feed intake decreases and the diet is not adjusted, first egg weight and body weight will decrease, thereafter the egg number. A "midnight snack" can help to maintain the feed intake in hot climate situations. There should be at least 3 hours of darkness before and after the midnight snack! For more information contact H&N International or your distributor.

In environmentally controlled houses, warm temperatures may be maintained during cold weather by utilizing the body heat produced by the birds. Proper management of the ventilation system will conserve heat and eliminate moisture. A proper blending of air intake and exchange rates is needed to control ammonia levels. A level of 25 ppm should never be exceeded!

Water Quality

Fresh, clean, potable water must be available at all times for the layers. Adequate consumption must be assured.



FEEDING IN THE LAY CYCLE

H&N "Nick Chick" can achieve their genetic performance potential using many different feeding programs. However, there are some precautions with regard to the lay diet that should be kept in mind. All layers require a minimum quantity of daily nutrients regardless of their consumption rate, but their actual intake is primarily governed by their energy requirements. Energy requirements are in turn determined by body weight, production rate, egg size, ambient temperature, air movement and feathering. To supply the prolific H&N layers with sufficient nutrients an ad libitum feed supply is recommended. All figures mentioned in the manual are only guidelines.

Feeding at Onset of Production and Through Peak

At 1 % production a peaking diet should be fed if a pre-lay diet has been used. If a pre-lay diet is not used, begin the use of the peaking diet at 18 weeks of age. The peaking diet can be a special diet which is designed for those layers at 100 % production. Recommended vitamin and trace mineral levels are found in Table 8.

Flocks in hot climates may not be able to consume normal amounts of feed. Such flocks should be fed denser diets (higher in nutrient concentration) as a means of compensating for low feed consumption.

Feeding after Peak

Adjustments in the feed formula for laying hens must be made, depending upon the quantity of feed consumed and rate of lay, to assure adequate nutrient intake for maximum production and egg size. Review the information in Tables 16 through 20. After peak (about 40 weeks of age) change the diet a couple weeks after production has gone below the next 5 % production level.

Table 15: Nutrient Levels Of Diets From 19-40 Weeks At various Feed Intakes to Provide The Recommended Daily Nutrient Intake

G/bird/day:	90	95	100	105	110
Lbs. Feed/100/Day Energy (kcal/lb)*	19.8 1445	20.9 1370	22 1300	23.1 1240	24.2 1180
Protein (%)	20.00	18.95	18.00	17.14	16.36
Calcium (%)	4.33	4.11	3.90	3.71	3.55
Phosphorus (%)**	0.71	0.68	0.64	0.61	0.58
Av. Phosphorus (%)	0.50	0.47	0.45	0.43	0.41
Sodium (%)	0.20	0.19	0.18	0.17	0.16
Chlorine (%)	0.20	0.19	0.18	0.17	0.16
Lysine (%)	0.00	0.87	0.83	0.79	0.75
Dig. Lysin (%)	0.76	0.72	0.68	0.65	0.62
Methionine (%)	0.45	0.43	0.41	0.39	0.37
Dig. Methionin (%)	0.37	0.35	0.33	0.32	0.30
Met. + Cys. (%)	0.83	0.79	0.75	0.71	0.68
Dig. Met.+Cys. (%)	0.68	0.64	0.61	0.58	0.56
Arginine (%)	0.95	0.90	0.85	0.81	0.78
Dig. Arginine (%)	0.78	0.74	0.70	0.67	0.64
Valine (%)	0.77	0.73	0.70	0.66	0.63
Dig. Valine (%)	0.66	0.62	0.59	0.56	0.54
Tryptophan (%)	0.20	0.19	0.18	0.17	0.17
Dig. Tryptophane (%)	0.17	0.16	0.15	0.14	0.14
Threonin (%)	0.64	0.61	0.58	0.55	0.53
Dig. Threonine (%)	0.53	0.50	0.48	0.45	0.43
Isoleucine (%)	0.74	0.70	0.66	0.63	0.60
Dig. Isoleucine (%)	0.60	0.57	0.54	0.52	0.49
Linoleic acid (%)	2.22	2.11	2.00	1.90	1.82

* A nutritionist should be consulted if the energy levels above 1370 or below 1240 kcal/lb (2980 or below 2755kcal/kg)
** Without Phytase

Table 16: Nutrient Levels Of Diets From 41-50 Weeks At various Feed Intakes to Provide The Recommended Daily Nutrient Intake

G/bird/day:	90	95	100	105	110
Lbs. Feed/100/Day Energy (kcal/lb*)	19.8 1445	20.9 1370	22 1300	23.1 1240	24.2 1180
Protein (%)	19.70	18.66	17.73	16.89	16.12
Calcium (%)	4.56	4.32	4.10	3.90	3.73
Phosphorus (%)**	0.70	0.67	0.63	0.60	0.58
Av. Phosphorus (%)	0.49	0.47	0.44	0.42	0.40
Sodium (%)	0.20	0.19	0.18	0.17	0.16
Chlorine (%)	0.20	0.19	0.18	0.17	0.16
Lysine (%)	0.00	0.86	0.82	0.78	0.74
Dig. Lysin (%)	0.74	0.71	0.67	0.64	0.61
Methionine (%)	0.44	0.42	0.40	0.38	0.36
Dig. Methionin (%)	0.36	0.35	0.33	0.31	0.30
Met. + Cys. (%)	0.82	0.77	0.74	0.70	0.67
Dig. Met.+Cys. (%)	0.67	0.63	0.60	0.57	0.55
Arginine (%)	0.93	0.89	0.84	0.80	0.76
Dig. Arginine (%)	0.77	0.73	0.69	0.66	0.63
Valine (%)	0.76	0.72	0.69	0.65	0.62
Dig. Valine (%)	0.65	0.61	0.58	0.55	0.53
Tryptophan (%)	0.20	0.19	0.18	0.17	0.16
Dig. Tryptophane (%)	0.16	0.16	0.15	0.14	0.13
Threonin (%)	0.64	0.60	0.57	0.54	0.52
Dig. Threonine (%)	0.52	0.49	0.47	0.45	0.43
Isoleucine (%)	0.73	0.69	0.65	0.62	0.59
Dig. Isoleucine (%)	0.60	0.56	0.54	0.51	0.49
Linoleic acid (%)	2.22	2.11	2.00	1.90	1.82

* A nutritionist should be consulted if the energy levels above 1370 or below 1240 kcal/lb (2980 or below 2755kcal/kg)
** Without Phytase

Table 17: Nutrient Levels Of Diets From 50-67 Weeks At various Feed Intakes to Provide The Recommended Daily Nutrient Intake

G/bird/day:	90	95	100	105	110
Lbs. Feed/100/Day Energy (kcal/lb*)	19.8 1445	20.9 1370	22 1300	23.1 1240	24.2 1180
Protein (%)	19.40	18.38	17.46	16.63	15.87
Calcium (%)	4.67	4.42	4.20	4.00	3.82
Phosphorus (%)**	0.69	0.66	0.62	0.59	0.57
Av. Phosphorus (%)	0.49	0.46	0.44	0.42	0.40
Sodium (%)	0.20	0.19	0.18	0.17	0.16
Chlorine (%)	0.20	0.19	0.18	0.17	0.16
Lysine (%)	0.00	0.85	0.80	0.77	0.73
Dig. Lysin (%)	0.73	0.69	0.66	0.63	0.60
Methionine (%)	0.44	0.41	0.39	0.38	0.36
Dig. Methionin (%)	0.36	0.34	0.32	0.31	0.29
Met. + Cys. (%)	0.80	0.76	0.72	0.69	0.66
Dig. Met.+Cys. (%)	0.66	0.62	0.59	0.57	0.54
Arginine (%)	0.92	0.87	0.83	0.79	0.75
Dig. Arginine (%)	0.75	0.72	0.68	0.65	0.62
Valine (%)	0.75	0.71	0.68	0.64	0.61
Dig. Valine (%)	0.64	0.60	0.57	0.55	0.52
Tryptophan (%)	0.20	0.19	0.18	0.17	0.16
Dig. Tryptophane (%)	0.16	0.15	0.15	0.14	0.13
Threonin (%)	0.63	0.59	0.56	0.54	0.51
Dig. Threonine (%)	0.51	0.49	0.46	0.44	0.42
Isoleucine (%)	0.72	0.68	0.64	0.61	0.59
Dig. Isoleucine (%)	0.59	0.56	0.53	0.50	0.48
Linoleic acid (%)	1.67	1.58	1.50	1.43	1.36

* A nutritionist should be consulted if the energy levels above 1370 or below 1240 kcal/lb (2980 or below 2755kcal/kg)
** Without Phytase

Table 18: Nutrient Levels Of Diets From 68–80 Weeks At various Feed Intakes to Provide The Recommended Daily Nutrient Intake

G/bird/day:	90	95	100	105	110
Lbs. Feed/100/Day Energy (kcal/lb*)	19.8 1445	20.9 1370	22 1300	23.1 1240	24.2 1180
Protein (%)	18.60	17.62	16.74	15.94	15.22
Calcium (%)	4.78	4.53	4.30	4.10	3.91
Phosphorus (%)**	0.66	0.63	0.60	0.57	0.54
Av. Phosphorus (%)	0.47	0.44	0.42	0.40	0.38
Sodium (%)	0.20	0.19	0.18	0.17	0.16
Chlorine (%)	0.20	0.19	0.18	0.17	0.16
Lysine (%)	0.00	0.81	0.77	0.73	0.70
Dig. Lysin (%)	0.70	0.67	0.63	0.60	0.57
Methionine (%)	0.42	0.40	0.38	0.36	0.34
Dig. Methionin (%)	0.34	0.33	0.31	0.30	0.28
Met. + Cys. (%)	0.77	0.73	0.69	0.66	0.63
Dig. Met.+Cys. (%)	0.63	0.60	0.57	0.54	0.52
Arginine (%)	0.88	0.84	0.79	0.76	0.72
Dig. Arginine (%)	0.72	0.69	0.65	0.62	0.59
Valine (%)	0.72	0.68	0.65	0.62	0.59
Dig. Valine (%)	0.61	0.58	0.55	0.52	0.50
Tryptophan (%)	0.19	0.18	0.17	0.16	0.15
Dig. Tryptophane (%)	0.15	0.15	0.14	0.13	0.13
Threonin (%)	0.60	0.57	0.54	0.51	0.49
Dig. Threonine (%)	0.49	0.47	0.44	0.42	0.40
Isoleucine (%)	0.69	0.65	0.62	0.59	0.56
Dig. Isoleucine (%)	0.56	0.53	0.51	0.48	0.46
Linoleic acid (%)	1.33	1.26	1.20	1.14	1.09

* A nutritionist should be consulted if the energy levels above 1370 or below 1240 kcal/lb (2980 or below 2755kcal/kg)
** Without Phytase

Table 19: Nutrient Levels Of Diets From 81–95 Weeks At various Feed Intakes to Provide The Recommended Daily Nutrient Intake

G / bird / day:	90	95	100	105	110
Lbs. Feed/100/Day Energy (kcal/lb*)	19.8 1445	20.9 1370	22 1300	23.1 1240	24.2 1180
Protein (%)	18.20	17.24	16.38	15.60	14.89
Calcium (%)	5.00	4.74	4.50	4.29	4.09
Phosphorus (%)**	0.65	0.62	0.59	0.56	0.53
Av. Phosphorus (%)	0.46	0.43	0.41	0.39	0.37
Sodium (%)	0.20	0.19	0.18	0.17	0.16
Chlorine (%)	0.20	0.19	0.18	0.17	0.16
Lysine (%)	0.00	0.79	0.75	0.72	0.69
Dig. Lysin (%)	0.69	0.65	0.62	0.59	0.56
Methionine (%)	0.41	0.39	0.37	0.35	0.34
Dig. Methionin (%)	0.34	0.32	0.30	0.29	0.28
Met. + Cys. (%)	0.75	0.71	0.68	0.65	0.62
Dig. Met.+Cys. (%)	0.62	0.59	0.56	0.53	0.51
Arginine (%)	0.86	0.82	0.78	0.74	0.71
Dig. Arginine (%)	0.71	0.67	0.64	0.61	0.58
Valine (%)	0.70	0.67	0.63	0.60	0.58
Dig. Valine (%)	0.60	0.57	0.54	0.51	0.49
Tryptophan (%)	0.18	0.17	0.17	0.16	0.15
Dig. Tryptophane (%)	0.15	0.14	0.14	0.13	0.12
Threonin (%)	0.59	0.56	0.53	0.50	0.48
Dig. Threonine (%)	0.48	0.46	0.43	0.41	0.39
Isoleucine (%)	0.67	0.64	0.60	0.57	0.55
Dig. Isoleucine (%)	0.55	0.52	0.50	0.47	0.45
Linoleic acid (%)	1.11	1.05	1.00	0.95	0.91

* A nutritionist should be consulted if the energy levels above 1370 or below 1240 kcal/lb (2980 or below 2755kcal/kg)
** Without Phytase

Table 20: Recommended Daily Nutrient Intake per Bird

Age in Weeks	Feed Consumption		ME kcal/Bird/Day	C. Protein Grams/Bird/Day	Methionine mg/Bird/Day	TSAA mg/Bird/Day	Lysine mg/Bird/Day	Calcium Grams/Bird/Day	Av. Phosphorus mg/Bird/Day
	Grams/Bird/Day	Feed/100/Day							
19	79	17	223	13.5	319	585	650	3.00	345
20	84	19	237	14.5	382	702	780	3.50	403
21	91	20	256	16.0	426	783	870	3.80	437
22	96	21	271	17.0	451	828	920	4.05	466
23	99	22	279	17.8	461	846	940	4.15	477
24	100	22	282	18.3	466	855	950	4.20	483
25	100	22	282	18.5	468	860	955	4.22	485
26	100	22	282	18.6	469	861	957	4.23	486
27	100	22	282	18.6	469	862	958	4.24	487
28	100	22	282	18.6	469	862	958	4.25	488
29	100	22	282	18.6	469	862	958	4.25	489
30	100	22	282	18.5	469	861	957	4.26	490
31	100	22	282	18.5	468	860	955	4.27	489
32	100	22	282	18.5	467	858	953	4.28	487
33	100	22	282	18.5	466	856	951	4.29	485
34	100	22	282	18.4	465	854	949	4.29	483
35	100	22	282	18.4	464	852	947	4.30	481
36	100	22	282	18.4	462	849	944	4.31	479
37	100	22	282	18.4	461	846	941	4.32	477
38	100	22	282	18.3	459	844	938	4.33	475
39	100	22	282	18.3	458	841	935	4.33	473
40	100	22	282	18.3	456	838	932	4.34	471
41	100	22	282	18.3	455	836	929	4.35	469
42	100	22	282	18.2	453	833	926	4.36	467
43	100	22	282	18.2	452	830	923	4.37	465
44	100	22	282	18.2	451	828	920	4.37	463
45	100	22	282	18.1	449	825	917	4.38	460
46	100	22	282	18.1	448	822	914	4.39	458
47	100	22	282	18.1	446	819	911	4.40	455
48	100	22	282	18.0	445	817	908	4.41	453
49	100	22	282	18.0	443	814	905	4.41	450
50	100	22	282	18.0	442	811	902	4.42	448
51	100	22	282	18.0	440	809	899	4.43	445
52	100	22	282	17.9	439	806	896	4.44	443
53	100	22	282	17.9	437	803	893	4.45	440
54	100	22	282	17.9	436	801	890	4.45	438
55	100	22	282	17.8	434	798	887	4.46	435
56	100	22	282	17.8	433	795	884	4.47	433
57	100	22	282	17.8	431	792	881	4.48	430

Table 20: Recommended Daily Nutrient Intake per Bird

Age in Weeks	Feed Consumption		ME kcal/Bird/Day	C. Protein Grams/Bird/Day	Methionine mg/Bird/Day	TSAA mg/Bird/Day	Lysine mg/Bird/Day	Calcium Grams/Bird/Day	Av. Phosphorus mg/Bird/Day
	Grams/Bird/Day	Feed/100/Day							
58	100	22	282	17.7	430	790	878	4.49	428
59	100	22	282	17.7	429	787	875	4.49	425
60	100	22	282	17.7	427	784	871	4.50	423
61	100	22	282	17.6	425	781	868	4.51	420
62	100	22	282	17.6	423	778	864	4.52	418
63	100	22	282	17.5	422	774	861	4.53	415
64	100	22	282	17.5	420	771	857	4.53	413
65	100	22	282	17.5	418	768	854	4.54	410
66	100	22	282	17.4	417	765	850	4.55	408
67	100	22	282	17.4	415	762	847	4.56	405
68	100	22	282	17.3	413	759	843	4.57	403
69	100	22	282	17.3	411	756	840	4.57	400
70	100	22	282	17.3	409	752	836	4.58	398
71	100	22	282	17.2	407	748	832	4.59	395
72	100	22	282	17.2	405	745	828	4.60	393
73	100	22	282	17.1	404	741	824	4.61	390
74	100	22	282	17.1	402	738	820	4.61	388
75	100	22	282	17.1	400	734	816	4.62	385
76	100	22	282	17.0	398	730	812	4.63	383
77	100	22	282	17.0	396	727	808	4.64	380
78	100	22	282	16.9	394	723	804	4.65	378
79	100	22	282	16.9	392	720	800	4.65	375
80	100	22	282	16.9	390	716	795	4.66	373
81	100	22	282	16.8	387	711	791	4.67	370
82	100	22	282	16.8	385	707	786	4.68	368
83	100	22	282	16.7	383	703	782	4.69	365
84	100	22	282	16.7	381	699	777	4.70	363
85	100	22	282	16.7	379	695	773	4.71	360
86	100	22	282	16.6	376	691	768	4.72	358
87	100	22	282	16.6	374	687	764	4.73	355
88	100	22	282	16.5	372	683	759	4.73	353
89	100	22	282	16.5	370	679	755	4.74	350
90	100	22	282	16.5	368	675	750	4.75	350
91	100	22	282	16.4	365	671	746	4.76	350
92	100	22	282	16.4	363	667	741	4.77	350
93	100	22	282	16.3	361	663	737	4.78	350
94	100	22	282	16.3	359	659	732	4.79	350
95	100	22	282	16.3	356	655	728	4.80	350

Table 21: Supply of Fine and Coarse Limestone

Feedtype	Fine Limestone	Coarse Limestone*
Layer Phase 1	40 %	60 %
Layer Phase 2	30 %	70 %
Layer Phase 3	30 %	70 %
Layer Phase 4 + 5	30 %	70 %

Feed Quality

Always maintain high feed quality. The basics include proper sampling of feed ingredients and mixed feed and the chemical analysis of those samples.

Feed Restriction in the Lay Cycle

H&N Nick Chicks are not normally prone to put on fat with correctly formulated feeds. Therefore, feed restriction is seldom recommended during the lay period. If a restriction program is used, watch egg size, body weight and percent production very closely. These traits will decline first if birds are being under fed.

Energy Requirement

The energy requirement of adult laying birds depends upon several factors, such as growth, maintenance, production and environmental temperatures. Under normal conditions layers eat mainly to satisfy their energy requirement. In order to maintain an optimal and persistent performance throughout the whole laying cycle do not reduce the energy level below 1240 kcal/lb (2755 kcal/kg = 11,4 MJ/kg). A method for the calculation of the feed energy is shown on the last page.

Calcium

Laying hens need adequate calcium in their diets for eggshell formation. Layers will have more available calcium if the dietary calcium sources are in two different forms. One form may be finely ground such as limestone. The other should be fed as large particle size such as oyster shell or hen-size limestone.

The bird's system is not as efficient at utilizing calcium sources after 40 weeks of age. Also, older flocks produce larger eggs and more calcium is needed to produce a strong shell on these bigger eggs. For these reasons higher levels of calcium should be formulated into the diet as the flock ages.

Available Phosphorus

There is little change in the available phosphorus requirements during the life of the flock. Be careful to provide only the level of available phosphorus intake necessary (about a half gram per bird per day). Too little or too much available phosphorus consumption can lead to shell quality problems. There is considerable research that indicates that available phosphorus intake as low as 350 mg at the end of the production cycle will improve shell quality but there is a great risk of accidentally feeding less than 350 mg; therefore, this low level is not recommended.

Post-Peak Body Weights, Production and Egg Weight

Body weight change, especially early in lay, is an indicator of proper or improper nutrient intake and should be considered as a part of the feeding program of the layer. At the start of egg production hens' bodies are not fully developed. The growth curve will continue and only flatten after 25 to 30 weeks of age when weekly body weight gain stays lower. Pullets must not lose weight after being transferred. They should continue to gain weight, or at least maintain their body weight. If body weight does not increase slightly, production and egg weight may suffer. After a flock is 36 weeks old, the body weight average should be relatively stable with only a very gradual increase. A slight gain in body weight indicates that sufficient nutrients are being consumed for maximum performance.

Excessive gains indicate excess amounts of nutrients. Adjust nutrient intake if excessive weight gain is present. If the body weight average should drop, the cause should be found immediately to avoid losses in production and egg mass.

If the above management recommendations are followed, the "Nick Chick" flock should obtain the performance in Tables 16 and 17. However, because of the large variation in feed quality, water quality, housing, weather and various other conditions, many flocks will deviate from these parameters.

Table 22: Feed Ingredients (Source: Feedstuffs, 2014)

	Dry Matter	Crude Protein	Ether Extract	Crude Fiber	Calcium	Total phosphorus	Available[7] phosphorus	Ash	Ruminant digestible protein	Ruminant TDN	– Poultry ME[6] –		– Swine ME[6] –	
INGREDIENTS[2]	%	%	%	%	%	%	%	%	%	%	Kcal/lb.	Kcal/kg	Kcal/lb.	Kcal/kg
Alfalfa meal, dehy	93	20.0	3.5	20.0	1.50	0.27	0.27	10.5	14.0	58	740	1630	1070	2350
Alfalfa meal, dehy	93	17.0	3.0	24.0	1.30	0.23	0.23	9.6	12.3	58	672	1480	1020	2250
Alfalfa meal, dehy	93	15.0	2.3	26.0	1.20	0.22	0.22	8.5	11.0	57	600	1320	945	2075
Alfalfa meal, suncured	91	15.0	1.7	29.0	1.40	0.20	0.20	9.0	11.0	55	350	770	790	1740
Bakery meal	91	10.0	10.0	3.0	0.10	0.25	0.18	4.0	6.0	82	1550	3417	1585	3494
Bakery meal, low ash/fiber	91	10.0	11.5	1.5	0.10	0.25	0.18	2.0	6.0	82	1750	3858	1800	3960
Barley, grain	89	11.5	1.9	5.0	0.08	0.42	0.15	2.5	8.6	74	1250	2750	1305	2870
Barley, grain, Western	91	10.6	2.2	6.3	0.04	0.35	0.12	2.7	6.4	73	1255	2760	1315	2900
Barley, malt, eehy	91	13.7	1.9	3.3	0.06	0.46	—	2.2	9.0	72	n/a	n/a	1490	3280
Beans, broad (vicia faba)	89	25.7	1.4	8.2	0.14	0.54	0.20	6.0	21.6	72	1100	2420	n/a	n/a
Beet pulp, dried	91	8.0	0.5	21.0	0.60	0.10	—	3.8	4.3	68	300	660	1065	2345
Blood meal, animal	89	80.0	1.0	1.0	0.28	0.22	0.22	4.4	63.1	60	1465	3220	875	1925
Brewers dried grain	93	27.9	7.4	11.7	0.30	0.66	0.20	4.8	19.1	73	1020	2245	850	1870
Brewers dried yeast	93	45.0	0.4	1.5	0.10	1.40	0.45	6.5	41.6	73	1130	2485	1205	2650
Buckwheat, grain	88	11.0	2.5	11.0	0.10	0.30	0.10	2.1	7.6	69	1200	2640	1285	2830
Buttermilk, dried	89	2.0	5.0	0.3	1.30	0.90	0.90	10.0	25.3	84	1250	2750	1370	3010
Camelina meal	90	33.9	12.0	12.4	0.33	0.94	—	5.8	—	—	1510	3328	n/a	n/a
Canola meal	91	38.0	3.8	11.1	0.68	1.20	0.40	7.2	32.0	64	960	2110	1180	2600
Casein, dried	90	80.0	0.5	0.2	0.60	1.00	1.00	3.5	76.0	74	1875	4120	1245	2740
Cassava tubers, meal	87	2.4	0.3	7.6	0.15	0.08	—	3.0	—	68	1325	2915	1510	3320
Cattle manure, dried	90	16.6	—	—	1.60	0.75	—	7.6	n/a	n/a	n/a	n/a	n/a	n/a
Citrus pulp, dried	91	6.0	3.7	12.2	1.40	0.10	—	4.6	3.0	74	600	1320	850	1875
Coconut meal, mech.	93	22.0	6.0	12.0	0.17	0.60	—	7.0	18.0	77	690	1520	1135	2500
Corn, yellow, grain	86	7.5	3.5	1.9	0.01	0.28	0.12	1.1	5.8	80	1530	3373	1520	3350
Corn, high oil, grain	87	8.4	6.0	2.0	0.01	0.26	0.09	1.2	n/a	85	1615	3560	1595	3520
Corn, dent, yellow, ears ground	88	7.5	3.0	10.0	0.04	0.20	0.07	1.5	4.3	73	1290	2840	1135	2500
Corn cobs, meal	89	2.3	0.4	35.0	0.11	0.04	—	1.5	1.8	42	240	528	140	305
Corn germ meal, wet milled	90	20.0	1.0	12.0	0.30	0.50	0.15	3.8	19.3	70	770	1700	1320	2900
Corn germ meal, dry milled	91	17.7	0.9	10.9	0.03	0.50	0.15	3.5	n/a	69	n/a	n/a	1190	2615
Corn gluten feed	88	21.0	2.0	10.0	0.20	0.90	0.22	7.8	19.3	75	795	1750	1090	2400
Corn gluten meal, 41%	90	42.0	2.0	4.0	0.16	0.40	0.25	3.0	35.7	76	1510	3310	1395	3070
Corn gluten meal, 60%	90	60.0	2.0	2.5	0.02	0.50	0.18	1.8	47.4	86	1700	3740	n/a	n/a
Cottonseed meal, 41%, pre-press solvent	90	41.0	1.5	12.7	0.17	1.00	0.32	6.4	30.6	71	880	1940	1200	2640
Cottonseed meal, 41%, mech. Extd	91	41.0	3.9	12.6	0.17	0.97	0.32	6.2	32.9	71	955	2100	1345	2955
Cottonseed meal, 41%, direct solvent	90	41.0	2.1	11.3	0.16	1.00	0.32	6.4	29.5	72	915	2010	1225	2690
Cottonseed hulls	90	4.0	4.4	43.0	0.14	0.09	—	2.5	3.2	47	n/a	n/a	n/a	n/a
Cottonseed, whole seeds with lint	92	23.0	19.0	26.0	0.19	0.61	n/a	4.4	19.0	96	n/a	n/a	n/a	n/a
Crab meal	95	30.0	2.2	10.5	18.00	1.50	1.50	31.0	24.9	27	675	1485	n/a	n/a
Distillers dried grains w/solubles (Beverage)	91	29.0	8.4	7.8	0.27	0.78	0.35	4.3	20.0	78	1090	2400	1485	3270
Distillers dried grains, corn	92	27.0	9.0	13.0	0.09	0.41	0.17	2.2	19.3	79	910	2000	1460	3210
Distillers dried grains w/solubles ("Normal oil"), corn	92	27.0	9.0	8.5	0.14	0.86	0.55	4.5	21.1	82	1245	2744	1497	3300
Distillers dried grains w/solubles ("Low oil"), corn	88	29.0	7.0	7.0	0.10	0.87	0.52	5.5	—	—	1150	2530	1410	3108
Distillers dried solubles, corn	92	27.0	9.0	4.0	0.35	1.30	1.20	8.2	22.8	78	1275	2810	1500	3300
Fat, animal	99	0.0	98.0	—	—	—	—	—	—	200	3600	7920	3615	7950
Fat, poultry	99	0.0	98.0	—	—	—	—	—	—	—	3800	8377	3820	8422
Fat, yellow grease	99	0.0	98.0	—	—	—	—	—	—	—	3750	8250	3750	8250
Fat, vegetable	99	0.0	99.0	—	—	—	—	—	—	—	4000	8800	3955	8700
Feather meal, poultry	93	85.0	4.0	1.5	0.20	0.70	0.70	3.9	70.1	63	1310	2880	1030	2270
Fish meal. AAFCO	88	59.0	5.6	1.0	5.50	3.30	3.30	20.2	n/a	59	1080	2600	1125	2480
Fish meal, herring, Atlantic	93	72.0	10.0	1.0	2.00	1.00	1.00	10.4	56.6	73	1450	3190	1420	3130
Fish meal, menhaden	92	62.0	9.2	1.0	4.80	3.00	3.00	19.0	48.6	71	1340	2950	1460	3220
Fish meal, anchovy, Peruvian	91	65.0	10.0	1.0	4.00	2.85	2.85	15.0	52.7	73	1280	2820	1340	2950
Fish meal, red fish	92	57.0	8.0	1.0	7.70	3.80	3.80	26.0	46.2	70	1350	2970	1160	2550
Fish meal, sardine	92	65.0	5.5	1.0	4.50	2.70	2.70	16.0	52.7	70	1300	2860	1160	2500
Fish meal, tuna	93	53.0	11.0	5.0	8.40	4.20	4.20	25.0	50.5	71	1150	2530	1150	2530
Fish meal, white	91	61.0	4.0	1.0	7.00	3.50	3.50	24.0	51.0	72	1180	2600	1120	2460
Fish meal, freshwater, Alewife	90	65.7	12.8	1.0	5.20	2.90	2.90	14.6	53.3	71	1560	3430	1565	3440
Fish solubles, condensed	51	31.0	4.0	0.5	0.10	0.50	0.50	10.0	41.3	42	905	1990	830	—
Fish solubles, dehy	93	40.0	6.0	5.5	0.40	1.20	1.20	12.5	n/a	76	1580	3480	1335	2940
Flaxseed	92	22.0	34.0	6.5	0.25	0.50	—	—	—	—	1795	3957	n/a	n/a
Hominy feed, corn screw-pressed	89	10.5	6.5	5.0	0.05	0.50	0.17	3.0	8.0	86	1410	3108	1530	3365
Kafir grain sorghum	90	11.8	2.9	2.0	0.04	0.33	—	1.5	7.9	65	1550	3410	1315	2895
Kelp meal, dehy	91	8.9	1.6	3.9	1.20	0.16	—	17.3	7.3	29	n/a	n/a	n/a	n/a

[1] n/a= Data Not Available [2] Data listed are intended to represent the ingredients shown. Due to factors that can infl uence individual lots, no guarantee is made that such lots will compare with the analysis in this table. [3] ppm= parts per million [4] A dash (—) indicates that the ingredient does not contain a signifi cant amount of that item. [5] All table data are basis "as fed" [6] ME = Metabolizable Energy [7] Available phosphorus values were determined in chicks unless otherwise noted [8] True Amino acid availability coeffi ceints were determined with cecectomized roosters

Table 22: Feed Ingredients (Source: Feedstuffs, 2014)

	AMINO ACIDS (Percent availability in parenthesis)[8]										
	Methioine	Cysteine	Lysine	Tryptohan	Threonine	Isoleucine	Histidine	Valine	Leucine	Arginine	Phenyl-alanine
INGREDIENTS[2]	%	%	%	%	%	%	%	%	%	%	%
Alfalfa meal, dehy	0.33	0.23	0.87	0.46	0.88	0.98	0.42	1.19	1.50	0.98	1.04
Alfalfa meal, dehy	0.28 (73)	0.18 (40)	0.73 (59)	0.45	0.75 (71)	0.84 (77)	0.35 (74)	1.04 (75)	1.3 (80)	0.75 (82)	0.91 (78)
Alfalfa meal, dehy	0.23	0.17	0.60	0.38	0.60	0.68	0.30	0.84	1.10	0.58	0.66
Alfalfa meal, suncured	0.20	0.17	0.60	0.38	0.60	0.60	0.22	0.60	1.10	0.58	0.58
Bakery meal	0.16 (85)	0.16 (80)	0.3 (64)	0.09	0.28 (72)	0.36 (84)	0.2 (82)	0.4 (81)	0.8 (86)	0.4 (84)	0.4 (86)
Bakery meal, low ash/fiber	0.16	0.16	0.30	0.09	0.28	0.36	0.20	0.40	0.80	0.40	0.40
Barley, grain	0.18 (79)	0.25 (81)	0.53 (78)	0.17	0.36 (77)	0.42 (82)	0.23 (87)	0.62 (81)	0.8 (86)	0.5 (85)	0.62 (88)
Barley, grain, Western	0.18	0.22	0.39	0.15	0.29	0.40	0.30	0.46	0.70	0.45	0.47
Barley, malt, eehy	0.20	n/a	0.50	0.20	0.40	0.60	0.30	0.70	0.70	0.40	0.60
Beans, broad (vicia faba)	0.25	0.14	1.52	0.24	0.98	1.00	0.60	1.22	1.60	2.20	0.98
Beet pulp, dried	0.01	0.01	0.60	0.10	0.40	0.30	0.20	0.40	0.60	0.30	0.30
Blood meal, animal	1.0 (91)	1.4 (76)	6.9 (86)	1.00	3.8 (87)	0.8 (78)	3.05 (84)	5.2 (87)	10.3 (89)	2.35 (87)	5.1 (88)
Brewers dried grain	0.60	0.40	0.90	0.40	1.00	2.00	0.47	1.69	3.20	1.30	1.82
Brewers dried yeast	1.00	0.50	3.40	0.80	2.50	2.20	1.30	2.37	3.20	2.20	1.86
Buckwheat, grain	0.18	0.20	0.60	0.18	0.44	0.35	0.26	0.53	0.53	0.80	0.44
Buttermilk, dried	0.70	0.38	2.40	0.50	1.60	2.70	0.90	2.80	3.40	1.10	1.50
Camelina meal	0.61 (92)	0.66 (85)	1.54 (86)	0.42 (93)	1.30 (84)	1.20 (89)	0.75 (91)	1.61 (88)	2.13 (91)	2.62 (94)	1.40 (92)
Canola meal	0.77 (90)	0.97 (73)	2.02 (79)	0.46 (82)	1.50 (78)	1.51 (83)	1.10 (85)	1.94 (82)	2.6 (87)	2.3 (90)	1.5 (87)
Casein, dried	2.7 (99)	0.3 (84)	7.0 (97)	1.00	3.8 (98)	5.7 (98)	2.5 (96)	6.8 (98)	8.7 (99)	3.4 (97)	4.6 (99)
Cassava tubers, meal	—	—	—	—	—	—	—	—	n/a	—	—
Cattle manure, dried	0.06	—	0.33	n/a	0.21	0.21	0.09	0.29	n/a	0.14	0.06
Citrus pulp, dried	0.08	0.11	0.20	0.06	n/a	n/a	n/a	n/a	n/a	0.28	n/a
Coconut meal, mech.	0.33 (83)	0.2 (48)	0.54 (58)	0.20	0.6 (58)	1.0 (78)	0.3 (69)	1.0 (78)	1.49 (80)	2.3 (85)	0.8 (84)
Corn, yellow, grain	0.18 (91)	0.18 (85)	0.24 (81)	0.07 (90)	0.29 (84)	0.29 (88)	0.25 (94)	0.42 (88)	1.0 (93)	0.4 (89)	0.42 (91)
Corn, high oil, grain	0.20	0.19	0.28	0.07	0.31	0.31	0.27	0.42	1.06	0.43	0.42
Corn, dent, yellow, ears ground	0.14	0.13	0.16	0.05	n/a	n/a	n/a	n/a	1.00	0.30	n/a
Corn cobs, meal	—	—	—	—	—	—	—	—	—	—	—
Corn germ meal, wet milled	0.60	0.40	0.90	0.20	1.10	0.70	0.70	1.20	1.70	1.30	0.90
Corn germ meal, dry milled	0.43	0.40	1.10	0.25	0.90	0.60	0.60	1.10	1.30	1.40	0.90
Corn gluten feed	0.5 (84)	0.5 (65)	0.6 (72)	0.10	0.9 (75)	0.6 (81)	0.7 (82)	1.04 (83)	1.9 (89)	1.0 (87)	0.8 (87)
Corn gluten meal, 41%	1.00	0.60	0.80	0.20	1.40	2.30	0.90	2.20	6.60	1.40	2.90
Corn gluten meal, 60%	1.9 (97)	1.1 (86)	1.0 (88)	0.30	2.0 (92)	2.3 (95)	1.2 (94)	2.70 (95)	9.4 (98)	1.9 (96)	3.8 (97)
Cottonseed meal, 41%, pre-press solvent	0.52 (73)	0.64 (73)	1.65 (67)	0.47	1.32 (71)	1.33 (75)	1.1 (69)	1.88 (78)	2.4 (77)	4.59 (87)	2.22 (86)
Cottonseed meal, 41%, mech. Extd	0.55	0.59	1.52	0.50	1.30	1.31	1.07	1.84	2.50	4.33	2.20
Cottonseed meal, 41%, direct solvent	0.51	0.62	1.70	0.52	1.34	1.33	1.10	1.82	2.40	4.66	2.23
Cottonseed hulls	—	—	—	—	—	—	—	—	—	—	—
Cottonseed, whole seeds with lint	0.40	0.41	1.02	0.30	0.81	0.75	0.73	1.10	0.75	2.71	1.25
Crab meal	0.50	0.20	1.40	0.30	1.20	1.20	0.50	1.50	1.60	1.70	1.20
Distillers dried grains w/solubles (Beverage)	0.46	0.52	0.81	0.20	1.12	1.93	0.81	1.83	2.34	1.12	1.93
Distillers dried grains, corn	0.45	0.32	0.90	0.21	0.30	0.93	0.60	1.20	2.60	1.00	0.60
Distillers dried grains w/solubles ("Normal oil"), corn	0.51 (84)	0.5 (74)	0.8 (70)	0.2 (76)	0.92 (72)	1.0 (84)	0.65 (80)	1.33 (81)	2.8 (89)	1.1 (73)	1.2 (88)
Distillers dried grains w/solubles ("Low oil"), corn	0.57	0.63	0.94	0.21	1.06	0.97	0.74	1.48	2.96	1.29	1.40
Distillers dried solubles, corn	0.60	0.60	0.90	0.20	1.00	1.20	0.60	1.60	2.10	1.00	1.50
Fat, animal	—	—	—	—	—	—	—	—	—	—	—
Fat, poultry	—	—	—	—	—	—	—	—	—	—	—
Fat, yellow grease	—	—	—	—	—	—	—	—	—	—	—
Fat, vegetable	—	—	—	—	—	—	—	—	—	—	—
Feather meal, poultry	0.65 (76)	4.0 (59)	2.05 (66)	0.50	3.8 (73)	3.66 (85)	0.78 (72)	5.75 (82)	7.8 (82)	5.75 (83)	3.54 (85)
Fish meal. AAFCO	1.72	0.57	5.17	0.67	2.49	3.64	1.53	3.26	4.69	3.73	2.68
Fish meal, herring, Atlantic	2.20	0.72	5.70	0.80	2.88	3.00	1.91	5.70	5.10	5.64	2.56
Fish meal, menhaden	1.7 (92)	0.5 (73)	4.7 (88)	0.50	2.75 (98)	2.40 (92)	1.52 (92)	2.80 (91)	4.4 (92)	3.65 (92)	2.28
Fish meal, anchovy, Peruvian	1.90	0.60	4.90	0.75	2.70	3.00	1.50	3.40	5.00	3.38	2.39
Fish meal, red fish	1.80	0.40	6.60	0.60	2.60	3.50	1.30	3.33	4.90	4.10	2.50
Fish meal, sardine	2.00	0.80	5.90	0.50	2.60	3.30	1.80	3.40	3.80	2.70	2.00
Fish meal, tuna	1.50	0.40	3.90	0.71	2.50	2.40	1.80	2.80	3.80	3.20	2.50
Fish meal, white	1.65	0.75	4.30	0.70	2.60	3.10	1.93	3.25	4.50	4.20	2.80
Fish meal, freshwater, Alewife	1.93	0.47	5.49	0.63	3.29	3.40	1.93	3.58	4.80	4.69	2.91
Fish solubles, condensed	0.45	0.19	1.46	0.11	0.70	0.70	1.09	1.00	1.60	1.37	0.70
Fish solubles, dehy	0.64	0.50	2.60	2.30	1.10	1.20	0.90	1.60	2.60	1.80	1.30
Flaxseed	0.35	0.42	0.92	0.22	0.77	0.95	0.44	1.17	1.25	2.05	0.97
Hominy feed, corn screw-pressed	0.22	0.12	0.45	0.12	0.43	0.38	0.36	0.59	0.90	0.60	0.40
Kafir grain sorghum	0.18	0.14	0.27	0.18	0.45	0.54	0.27	0.63	1.60	0.35	0.63
Kelp meal, dehy	0.10	n/a	0.04	n/a	0.03	n/a	n/a	n/a	0.09	0.10	n/a

[1] n/a= Data Not Available [2] Data listed are intended to represent the ingredients shown. Due to factors that can infl uence individual lots, no guarantee is made that such lots will compare with the analysis in this table. [3] ppm= parts per million [4] A dash (—) indicates that the ingredient does not contain a signifi cant amount of that item. [5] All table data are basis "as fed" [6] ME = Metabolizable Energy [7] Available phosphorus values were determined in chicks unless otherwise noted [8] True Amino acid availability coeffi cients were determined with cecectomized roosters

Table 22: Feed Ingredients (Source: Feedstuffs, 2014)

	VITAMINS										
	Carotene	Vitamin A	Vitamin E	Thiamin	Riboflavin	Pantothenic acid	Biotin	Folic acid	Choline	Vitamin B12	Niacin
INGREDIENTS[2]	mg/kg	IU/g	mg/kg	mg/kg	mg/kg	mg/kg	ug/kg	ug/kg	mg/kg	ug/kg	mg/kg
Alfalfa meal, dehy	123	248.0	147.0	3.90	15.50	32.6	300	2600	1614	—[4]	54.6
Alfalfa meal, dehy	110	123.0	128.0	3.50	12.30	29.9	270	2000	1515	—	45.7
Alfalfa meal, dehy	63	100.0	98.0	3.00	10.60	20.8	250	1540	1548	—	41.8
Alfalfa meal, suncured	45	6.0	40.0	2.80	8.70	15.3	250	1300	1500	—	35.3
Bakery meal	5	3.9	25.0	1.50	1.50	14.5	n/a	150	1230	n/a[1]	18.0
Bakery meal, low ash/fiber	5	3.9	25.0	1.50	1.50	14.5	n/a	150	1230	n/a	18.0
Barley, grain	—	—	36.0	5.00	2.00	6.4	200	397	1027	—	57.2
Barley, grain, Western	—	—	36.0	4.00	1.30	7.3	150	300	930	—	44.0
Barley, malt, eehy	—	—	n/a	4.00	2.90	7.9	n/a	n/a	895	n/a	56.7
Beans, broad (vicia faba)	—	—	1.0	5.50	1.60	2.7	90	n/a	1670	—	22.4
Beet pulp, dried	0	0.4	—	0.22	1.10	0.8	n/a	n/a	800	—	19.8
Blood meal, animal	—	—	—	0.44	1.50	1.1	80	80	990	—	31.0
Brewers dried grain	—	—	65.1	0.70	1.50	8.6	80	220	2110	4.00	46.4
Brewers dried yeast	—	—	2.2	94.60	38.50	114.0	5000	9000	4800	—	479.0
Buckwheat, grain	—	—	—	3.30	10.60	11.0	n/a	n/a	440	—	18.0
Buttermilk, dried	—	—	—	3.70	31.00	29.7	290	400	1808	20.00	8.6
Camelina meal	—	—	—	—	—	—	—	—	—	—	—
Canola meal	—	—	—	5.20	3.70	9.5	900	2300	6700	—	159.5
Casein, dried	—	—	—	0.40	1.50	2.6	40	400	209	—	1.3
Cassava tubers, meal	—	—	—	—	—	—	—	—	—	—	—
Cattle manure, dried	—	—	—	—	—	n/a	n/a	n/a	n/a	—	n/a
Citrus pulp, dried	—	—	—	1.32	2.20	14.0	n/a	n/a	748	—	22.5
Coconut meal, mech.	—	—	—	0.66	3.30	6.1	n/a	n/a	1100	—	28.6
Corn, yellow, grain	2	1.7	22.0	2.60	1.10	3.9	80	116	1100	—	21.5
Corn, high oil, grain	n/a	1.9	28.0	2.50	n/a	4.5	n/a	112	n/a	—	25.0
Corn, dent, yellow, ears ground	2	2.0	—	—	0.80	4.4	n/a	n/a	350	—	15.8
Corn cobs, meal	1	1.0	—	—	1.10	3.8	n/a	n/a	n/a	—	7.3
Corn germ meal, wet milled	2	—	80.8	6.00	4.00	6.7	220	200	2000	—	41.8
Corn germ meal, dry milled	2	n/a	87.0	n/a	3.70	3.3	n/a	n/a	1936	n/a	42.0
Corn gluten feed	8	13.1	14.8	2.00	2.40	17.8	220	200	2420	—	75.0
Corn gluten meal, 41%	16	25.0	19.9	0.22	1.50	9.6	150	220	330	—	54.5
Corn gluten meal, 60%	44	60.0	25.5	0.28	2.20	2.9	220	230	2200	—	81.0
Cottonseed meal, 41%, pre-press solvent	—	—	15.0	3.30	4.00	7.0	550	2662	2933	—	40.3
Cottonseed meal, 41%, mech. Extd	—	—	15.0	9.70	4.20	7.7	528	2728	2807	—	37.8
Cottonseed meal, 41%, direct solvent	—	—	15.0	7.70	4.40	9.9	550	2794	2706	—	39.2
Cottonseed hulls	—	—	—	—	3.70	—	—	—	—	—	—
Cottonseed, whole seeds with lint	—	—	—	—	—	—	—	—	—	—	—
Crab meal	—	—	—	—	7.50	6.6	n/a	n/a	2024	448.00	44.0
Distillers dried grains w/solubles (Beverage)	—	—	n/a	4.00	9.60	12.3	400	880	4005	n/a	81.3
Distillers dried grains, corn	2	3.1	30.5	1.60	2.80	5.9	400	—	1850	—	42.2
Distillers dried grains w/solubles ("Normal oil"), corn	4	2.7	40.0	3.50	9.00	11.4	300	880	3400	—	79.9
Distillers dried grains w/solubles ("Low oil"), corn	—	—	—	—	—	—	—	—	—	—	—
Distillers dried solubles, corn	—	1.2	55.8	5.90	11.40	21.8	1100	1100	4818	—	120.0
Fat, animal	—	—	7.9	—	—	—	—	—	—	—	—
Fat, poultry	—	—	—	—	—	—	—	—	—	—	—
Fat, yellow grease	—	—	—	—	—	—	—	—	—	—	—
Fat, vegetable	—	—	56.8	—	—	—	—	—	—	—	—
Feather meal, poultry	—	—	—	—	2.00	11.0	44	220	880	70.00	30.8
Fish meal. AAFCO	—	—	18.5	1.30	6.50	8.7	n/a	n/a	3510	250.00	60.8
Fish meal, herring, Atlantic	—	—	16.8	0.10	8.70	21.7	200	520	5240	588.00	141.6
Fish meal, menhaden	—	—	5.7	0.20	4.80	8.8	150	1000	3080	150.00	55.0
Fish meal, anchovy, Peruvian	—	—	5.6	0.10	7.50	20.3	200	220	5100	600.00	135.0
Fish meal, red fish	—	—	5.6	1.50	7.00	8.4	200	n/a	3429	n/a	35.0
Fish meal, sardine	—	—	5.6	0.08	4.40	14.3	100	n/a	3880	300.00	100.0
Fish meal, tuna	—	—	5.6	n/a	8.80	8.8	n/a	n/a	3050	143.00	65.0
Fish meal, white	—	—	5.6	1.51	4.60	4.7	n/a	n/a	4050	71.00	38.0
Fish meal, freshwater, Alewife	—	—	5.6	0.10	3.70	10.0	n/a	n/a	4230	284.00	34.0
Fish solubles, condensed	—	2.2	—	5.50	14.50	35.4	200	n/a	4028	350.00	169.0
Fish solubles, dehy	—	—	—	6.80	16.50	48.4	490	726	3960	308.00	209.0
Flaxseed	—	—	18.9	7.00	4.50	—	—	—	3150	—	41.0
Hominy feed, corn screw-pressed	9	15.3	—	8.30	2.20	7.7	130	330	1500	—	49.7
Kafir grain sorghum	—	0.6	—	3.80	1.40	12.2	n/a	n/a	n/a	—	36.6
Kelp meal, dehy	86	66.0	150.0	1.00	5.00	7.0	100	100	275	0.00	23.0

[1] n/a= Data Not Available [2] Data listed are intended to represent the ingredients shown. Due to factors that can infl uence individual lots, no guarantee is made that such lots will compare with the analysis in this table. [3] ppm= parts per million [4] A dash (—) indicates that the ingredient does not contain a signifi cant amount of that item. [5] All table data are basis "as fed" [6] ME = Metabolizable Energy [7] Available phosphorus values were determined in chicks unless otherwise noted [8] True Amino acid availability coeffi cients were determined with cecectomized roosters

Table 22: Feed Ingredients (Source: Feedstuffs, 2014)

	MINERALS									
	Sodium	Potassium	Chloride	Magnesium	Sulphur	Manganese	Iron	Copper	Zinc	Selenium
INGREDIENTS[2]	%	%	%	%	%	ppm[3]	ppm	ppm	ppm	ppm
Alfalfa meal, dehy	0.08	2.50	0.47	0.32	0.43	40.0	320.0	10.0	23.0	0.50
Alfalfa meal, dehy	0.08	2.40	0.47	0.26	0.21	35.0	400.0	10.0	21.0	0.60
Alfalfa meal, dehy	0.07	2.30	0.49	0.26	0.17	30.0	450.0	10.0	21.0	0.50
Alfalfa meal, suncured	0.06	2.10	0.49	0.22	0.17	30.0	410.0	10.0	20.0	0.50
Bakery meal	1.14	0.10	1.25	0.32	0.02	60.0	50.0	5.0	15.0	0.40
Bakery meal, low ash/fiber	1.14	0.10	1.25	0.32	0.02	60.0	50.0	5.0	15.0	0.40
Barley, grain	0.03	0.56	0.14	0.12	0.15	16.0	80.0	8.0	30.0	0.20
Barley, grain, Western	0.02	0.56	0.14	0.12	0.15	16.0	80.0	8.0	20.0	0.10
Barley, malt, eehy	0.08	0.43	n/a	0.18	n/a	19.0	60.0	6.0	40.0	n/a
Beans, broad (vicia faba)	0.08	1.20	0.04	0.13	n/a	8.0	65.0	4.0	42.0	n/a
Beet pulp, dried	0.19	0.21	n/a	0.27	0.20	35.0	300.0	13.0	1.0	n/a
Blood meal, animal	0.31	0.90	0.28	0.22	0.32	5.0	2500.0	10.0	300.0	n/a
Brewers dried grain	0.26	0.08	0.12	0.19	0.30	38.0	290.0	21.0	100.0	0.70
Brewers dried yeast	0.07	1.72	n/a	0.23	n/a	6.0	100.0	33.0	39.0	1.0-1.5
Buckwheat, grain	0.05	0.45	0.04	0.10	—	34.0	44.0	10.0	9.0	n/a
Buttermilk, dried	0.95	1.00	0.70	0.48	0.08	4.0	n/a	n/a	n/a	0.12
Camelina meal	0.10	1.24	—	0.40	—	45.0	n/a	9.0	85.0	—
Canola meal	—	1.29	n/a	0.60	1.00	54.0	175.0	8.0	65.0	1.00
Casein, dried	0.01	n/a	n/a	n/a	n/a	4.0	17.0	4.0	30.0	n/a
Cassava tubers, meal	n/a	0.23	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Cattle manure, dried	0.36	0.72	n/a	0.27	n/a	88.0	80.0	15.0	111.0	n/a
Citrus pulp, dried	0.10	1.00	n/a	0.12	0.07	6.0	100.0	6.0	10.0	n/a
Coconut meal, mech.	0.06	0.60	0.03	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Corn, yellow, grain	0.02	0.33	0.04	0.08	0.08	4.5	25.0	2.9	20.0	0.08
Corn, high oil, grain	0.01	0.31	0.05	0.09	0.08	6.0	28.0	4.0	19.0	0.90
Corn, dent, yellow, ears ground	n/a	0.53	n/a	0.13	0.19	n/a	n/a	n/a	n/a	0.08
Corn cobs, meal	n/a	0.76	n/a	0.06	0.42	6.0	210.0	7.0	n/a	0.08
Corn germ meal, wet milled	0.04	0.30	n/a	0.16	0.32	4.0	330.0	4.0	100.0	0.33
Corn germ meal, dry milled	0.04	0.30	n/a	0.10	0.30	17.0	320.0	13.0	75.0	n/a
Corn gluten feed	0.15	1.30	0.22	0.42	0.16	24.0	460.0	35.0	80.0	0.22
Corn gluten meal, 41%	0.10	0.03	0.08	0.05	0.60	7.0	400.0	28.0	—	1.00
Corn gluten meal, 60%	0.03	0.45	0.05	0.15	0.50	4.0	400.0	22.0	41.0	1.00
Cottonseed meal, 41%, pre-press solvent	0.04	1.22	0.04	0.40	0.21	20.0	110.0	18.0	62.0	0.30
Cottonseed meal, 41%, mech. Extd	0.04	1.20	0.04	0.42	0.40	22.0	100.0	17.0	60.0	0.30
Cottonseed meal, 41%, direct solvent	0.04	1.16	0.04	0.40	0.30	21.0	90.0	16.0	60.0	0.30
Cottonseed hulls	0.02	0.87	n/a	0.13	—	—	—	—	—	—
Cottonseed, whole seeds with lint	0.01	1.07	0.06	0.41	0.23	17.0	100.0	8.0	34.0	0.14
Crab meal	0.85	0.45	1.50	0.88	0.04	133.0	440.0	33.0	102.0	3.80
Distillers dried grains w/solubles (Beverage)	0.60	0.86	0.18	0.34	0.30	40.0	320.0	73.0	70.0	0.20
Distillers dried grains, corn	0.25	0.16	0.07	0.20	0.43	23.0	300.0	30.0	55.0	0.35
Distillers dried grains w/solubles ("Normal oil"), corn	0.20	1.00	0.17	0.42	0.30	30.0	300.0	50.0	85.0	0.35
Distillers dried grains w/solubles ("Low oil"), corn	0.16	1.15	0.17	0.30	—	14.0	106.0	53.0	67.0	0.25
Distillers dried solubles, corn	0.18	1.74	0.25	0.64	0.37	74.0	600.0	83.0	85.0	0.33
Fat, animal	—	—	—	—	—	—	—	—	—	—
Fat, poultry	—	—	—	—	—	—	—	—	—	—
Fat, yellow grease	—	—	—	—	—	—	—	—	—	—
Fat, vegetable	—	—	—	—	—	—	—	—	—	—
Feather meal, poultry	0.70	0.30	0.28	0.20	1.40	9.0	70.0	7.0	55.0	0.80
Fish meal. AAFCO	1.07	0.39	n/a	0.21	0.24	23.0	360.0	15.0	100.0	1.5-2.0
Fish meal, herring, Atlantic	0.73	1.50	0.90	0.18	0.62	5.0	110.0	5.0	100.0	2.00
Fish meal, menhaden	0.68	0.96	0.80	0.21	0.45	40.0	880.0	8.0	92.0	2.00
Fish meal, anchovy, Peruvian	0.88	0.90	0.60	0.27	0.54	9.0	226.0	9.0	100.0	2.70
Fish meal, red fish	0.10	0.30	n/a	0.15	0.45	8.0	280.0	8.0	88.0	1.80
Fish meal, sardine	0.18	0.30	n/a	0.10	0.30	25.0	300.0	20.0	105.0	1.80
Fish meal, tuna	0.70	0.40	n/a	0.30	n/a	10.0	650.0	6.0	240.0	4.00
Fish meal, white	0.97	1.10	0.50	0.22	n/a	10.0	80.0	8.0	80.0	1.50
Fish meal, freshwater, Alewife	0.24	0.60	n/a	0.15	n/a	20.0	620.0	18.0	100.0	1.70
Fish solubles, condensed	1.00	1.75	2.65	0.02	0.13	12.0	300.0	48.0	38.0	2.00
Fish solubles, dehy	0.40	2.50	n/a	0.27	0.45	10.0	948.0	20.0	76.0	2.70
Flaxseed	0.08	1.50	—	0.50	—	—	236.0	22.0	91.0	—
Hominy feed, corn screw-pressed	0.10	0.67	0.05	0.24	—	15.0	65.0	15.0	3.0	0.15
Kafir grain sorghum	n/a	0.34	n/a	0.15	0.16	16.0	100.0	6.0	n/a	0.5-1.0
Kelp meal, dehy	2.40	2.30	n/a	0.85	0.73	62.0	566.0	5.0	46.0	0.40

[1] n/a= Data Not Available [2] Data listed are intended to represent the ingredients shown. Due to factors that can infl uence individual lots, no guarantee is made that such lots will compare with the analysis in this table. [3] ppm= parts per million [4] A dash (—) indicates that the ingredient does not contain a signifi cant amount of that item. [5] All table data are basis "as fed" [6] ME = Metabolizable Energy [7] Available phosphorus values were determined in chicks unless otherwise noted [8] True Amino acid availability coeffi ceints were determined with cecectomized roosters

PERFORMANCE IN THE LAY CYCLE

Laying Cycle Records

In order to evaluate performance and profitability, detailed laying cycle records are necessary. Daily figures for hen-day production, egg weight, feed and water consumption as well as mortality are necessary. This information will allow you to calculate very important data including daily egg mass, accumulative egg mass and feed conversion. All results should be graphed. Use of graphs will improve analyses of flock performance trends. As with growing records, accurate cage and/or pen counts are very important.

"Nick Chick" flocks, given proper nutrition and management, will continue to produce acceptable egg numbers and shell quality to at least 95 weeks of age. If circumstances indicate that force molting is advantageous, producers will find that "Nick Chick" flocks will perform very well after the molt.

Table 23: Expected Egg Grades (%) for Different Egg Weights – within Production Weeks

Week	Egg Weight gram	Egg Weight Net. lbs / 30 Doz. Case	< 42 Pewee < 18 (Oz. / Doz.)	42 – 50 Small 18 – 21 (Oz. / Doz.)	50 – 57 Medium 21 – 24 (Oz. / Doz.)	57 – 64 Large 24 – 27 (Oz. / Doz.)	64 – 71 Extra Large 27 – 30 (Oz. / Doz.)	> 71 Jumbo > 30 (Oz. / Doz.)
19	40.6	32.2	69.1	31.0	0.0	0.0	0.0	0.0
20	44.0	34.9	25.8	71.6	2.6	0.0	0.0	0.0
21	46.3	36.7	9.4	77.6	12.8	0.2	0.0	0.0
22	48.5	38.5	2.9	64.0	31.6	1.5	0.0	0.0
23	50.5	40.1	0.9	43.6	49.3	6.2	0.0	0.0
24	52.2	41.4	0.3	27.3	57.4	15.0	0.1	0.0
25	54.0	42.9	0.1	14.4	55.6	29.5	0.4	0.0
26	55.5	44.0	0.0	7.4	47.5	43.9	1.1	0.0
27	56.5	44.8	0.0	5.1	39.9	51.9	3.0	0.0
28	57.5	45.6	0.0	2.9	32.1	60.2	4.8	0.0
29	58.0	46.0	0.0	2.4	28.7	61.9	6.9	0.1
30	58.5	46.4	0.0	2.0	25.3	63.6	9.0	0.1
31	58.8	46.7	0.0	1.6	23.1	65.2	10.0	0.1
32	59.0	46.8	0.0	1.5	21.9	65.3	11.1	0.2
33	59.3	47.1	0.0	1.3	20.2	65.5	12.8	0.3
34	59.5	47.2	0.0	1.0	18.5	67.0	13.3	0.2
35	59.8	47.5	0.0	0.9	17.1	66.3	15.3	0.3
36	60.0	47.6	0.0	0.9	16.2	65.9	16.6	0.4
37	60.2	47.8	0.0	0.8	15.3	65.5	17.9	0.5
38	60.3	47.9	0.0	0.8	14.8	65.3	18.6	0.6
39	60.5	48.0	0.0	0.7	13.9	64.8	19.9	0.7
40	60.6	48.1	0.0	0.6	13.0	65.5	20.3	0.6
41	60.8	48.3	0.0	0.5	12.3	64.6	21.7	0.8
42	60.9	48.3	0.0	0.5	12.0	64.2	22.5	0.9
43	61.1	48.5	0.0	0.5	11.2	63.3	23.9	1.1
44	61.2	48.6	0.0	0.5	10.9	62.9	24.6	1.1
45	61.4	48.7	0.0	0.4	10.2	62.0	26.1	1.3
46	61.5	48.8	0.0	0.3	9.4	62.4	26.8	1.1
47	61.7	49.0	0.0	0.3	8.8	61.2	28.2	1.4
48	61.8	49.0	0.0	0.3	8.6	60.6	28.9	1.6
49	62.0	49.2	0.0	0.3	8.1	59.4	30.4	1.9
50	62.1	49.3	0.0	0.3	7.8	58.8	31.1	2.1
51	62.3	49.4	0.0	0.2	7.3	57.6	32.5	2.4
52	62.4	49.5	0.0	0.2	7.0	56.9	33.2	2.5
53	62.6	49.7	0.0	0.2	6.2	56.1	35.0	2.5
54	62.7	49.8	0.0	0.2	6.0	55.4	35.6	2.8
55	62.9	49.9	0.0	0.2	5.7	54.0	36.9	3.2
56	63.0	50.0	0.0	0.2	5.5	53.3	37.6	3.5
57	63.1	50.1	0.0	0.2	5.3	52.6	38.2	3.7

Table 23: Expected Egg Grades (%) for Different Egg Weights – within Production Weeks

Week	Egg Weight gram	Egg Weight Net. lbs / 30 Doz. Case	< 42 Pewee < 18 (Oz. / Doz.)	42 – 50 Small 18 – 21 (Oz. / Doz.)	50 – 57 Medium 21 – 24 (Oz. / Doz.)	57 – 64 Large 24 – 27 (Oz. / Doz.)	64 – 71 Extra Large 27 – 30 (Oz. / Doz.)	> 71 Jumbo > 30 (Oz. / Doz.)
58	63.2	50.2	0.0	0.1	5.1	51.9	38.9	4.0
59	63.3	50.2	0.0	0.1	4.9	51.2	39.5	4.2
60	63.4	50.3	0.0	0.1	4.7	50.5	40.2	4.5
61	63.5	50.4	0.0	0.1	4.3	49.9	41.5	4.2
62	63.6	50.5	0.0	0.1	4.1	49.2	42.0	4.5
63	63.7	50.6	0.0	0.1	4.0	48.5	42.5	4.9
64	63.8	50.6	0.0	0.1	3.9	47.7	43.1	5.2
65	63.9	50.7	0.0	0.1	3.8	47.0	43.6	5.6
66	64.0	50.8	0.0	0.1	3.6	46.3	44.1	5.9
67	64.0	50.8	0.0	0.1	3.6	46.3	44.1	5.9
68	64.0	50.8	0.0	0.1	3.6	46.3	44.1	5.9
69	64.0	50.8	0.0	0.1	3.6	46.3	44.1	5.9
70	64.0	50.8	0.0	0.1	3.6	46.3	44.1	5.9
71	64.0	50.8	0.0	0.1	3.6	46.3	44.1	5.9
72	64.0	50.8	0.0	0.1	3.6	46.3	44.1	5.9
73	64.0	50.8	0.0	0.1	3.6	46.3	44.1	5.9
74	64.0	50.8	0.0	0.1	3.6	46.3	44.1	5.9
75	64.0	50.8	0.0	0.1	3.6	46.3	44.1	5.9
76	64.0	50.8	0.0	0.1	3.6	46.3	44.1	5.9
77	64.0	50.8	0.0	0.1	3.6	46.3	44.1	5.9
78	64.0	50.8	0.0	0.1	3.6	46.3	44.1	5.9
79	64.0	50.8	0.0	0.1	3.6	46.3	44.1	5.9
80	64.0	50.8	0.0	0.1	3.6	46.3	44.1	5.9
81	64.1	50.9	0.0	0.1	3.5	45.5	44.6	6.3
82	64.1	50.9	0.0	0.1	3.5	45.5	44.6	6.3
83	64.1	50.9	0.0	0.1	3.5	45.5	44.6	6.3
84	64.1	50.9	0.0	0.1	3.5	45.5	44.6	6.3
85	64.1	50.9	0.0	0.1	3.5	45.5	44.6	6.3
86	64.1	50.9	0.0	0.1	3.5	45.5	44.6	6.3
87	64.1	50.9	0.0	0.1	3.5	45.5	44.6	6.3
88	64.1	50.9	0.0	0.1	3.5	45.5	44.6	6.3
89	64.1	50.9	0.0	0.1	3.5	45.5	44.6	6.3
90	64.1	50.9	0.0	0.1	3.5	45.5	44.6	6.3
91	64.1	50.9	0.0	0.1	3.5	45.5	44.6	6.3
92	64.1	50.9	0.0	0.1	3.5	45.5	44.6	6.3
93	64.1	50.9	0.0	0.1	3.5	45.5	44.6	6.3
94	64.1	50.9	0.0	0.1	3.5	45.5	44.6	6.3
95	64.1	50.9	0.0	0.1	3.5	45.5	44.6	6.3

Table 24: Expected Egg Grades (%) for Different Egg Weights – Cumulative over Production Period

Week	Egg Weight gram	Egg Weight Net. lbs / 30 Doz. Case	< 42 Pewee < 18 (Oz. / Doz.)	42 – 50 Small 18 – 21 (Oz. / Doz.)	50 – 57 Medium 21 – 24 (Oz. / Doz.)	57 – 64 Large 24 – 27 (Oz. / Doz.)	64 – 71 Extra Large 27 – 30 (Oz. / Doz.)	> 71 Jumbo > 30 (Oz. / Doz.)
19	40.6	32.2	69.1	31.0	0.0	0.0	0.0	0.0
20	44.0	34.9	35.4	62.6	2.0	0.0	0.0	0.0
21	46.3	36.7	20.7	71.1	8.1	0.1	0.0	0.0
22	48.5	38.5	12.9	68.0	18.4	0.7	0.0	0.0
23	50.5	40.1	8.8	59.7	29.0	2.6	0.0	0.0
24	52.2	41.4	6.4	50.8	36.7	6.0	0.0	0.0
25	54.0	42.9	5.0	42.8	40.9	11.1	0.1	0.0
26	55.5	44.0	4.1	36.4	42.1	17.1	0.3	0.0
27	56.5	44.8	3.5	31.5	41.8	22.5	0.7	0.0
28	57.5	45.6	3.0	27.6	40.5	27.6	1.3	0.0
29	58.0	46.0	2.7	24.6	39.0	31.7	1.9	0.0
30	58.5	46.4	2.4	22.2	37.6	35.1	2.7	0.0
31	58.8	46.7	2.1	20.2	36.2	38.0	3.4	0.0
32	59.0	46.8	2.0	18.6	34.9	40.4	4.1	0.0
33	59.3	47.1	1.8	17.1	33.7	42.5	4.8	0.1
34	59.5	47.2	1.7	15.9	32.6	44.3	5.4	0.1
35	59.8	47.5	1.5	14.9	31.5	45.9	6.1	0.1
36	60.0	47.6	1.4	14.0	30.5	47.2	6.8	0.1
37	60.2	47.8	1.4	13.2	29.6	48.3	7.5	0.1
38	60.3	47.9	1.3	12.5	28.7	49.3	8.1	0.2
39	60.5	48.0	1.2	11.8	27.9	50.1	8.8	0.2
40	60.6	48.1	1.1	11.2	27.1	50.9	9.4	0.2
41	60.8	48.3	1.1	10.7	26.4	51.6	10.0	0.2
42	60.9	48.3	1.0	10.3	25.8	52.1	10.5	0.3
43	61.1	48.5	1.0	9.8	25.1	52.6	11.1	0.3
44	61.2	48.6	1.0	9.4	24.5	53.1	11.7	0.3
45	61.4	48.7	0.9	9.1	24.0	53.4	12.3	0.4
46	61.5	48.8	0.9	8.7	23.4	53.8	12.8	0.4
47	61.7	49.0	0.8	8.4	22.9	54.0	13.4	0.4
48	61.8	49.0	0.8	8.1	22.3	54.3	13.9	0.5
49	62.0	49.2	0.8	7.9	21.9	54.5	14.5	0.5
50	62.1	49.3	0.8	7.6	21.4	54.6	15.1	0.6
51	62.3	49.4	0.7	7.4	20.9	54.7	15.6	0.6
52	62.4	49.5	0.7	7.2	20.5	54.8	16.2	0.7
53	62.6	49.7	0.7	7.0	20.1	54.8	16.7	0.8
54	62.7	49.8	0.7	6.8	19.7	54.8	17.3	0.8
55	62.9	49.9	0.7	6.6	19.3	54.8	17.8	0.9
56	63.0	50.0	0.6	6.4	18.9	54.8	18.3	1.0
57	63.1	50.1	0.6	6.2	18.6	54.7	18.9	1.0

Table 24: Expected Egg Grades (%) for Different Egg Weights – Cumulative over Production Period

Week	Egg Weight gram	Egg Weight Net. lbs / 30 Doz. Case	< 42 Pewee < 18 (Oz. / Doz.)	42 – 50 Small 18 – 21 (Oz. / Doz.)	50 – 57 Medium 21 – 24 (Oz. / Doz.)	57 – 64 Large 24 – 27 (Oz. / Doz.)	64 – 71 Extra Large 27 – 30 (Oz. / Doz.)	> 71 Jumbo > 30 (Oz. / Doz.)
58	63.2	50.2	0.6	6.1	18.2	54.6	19.4	1.1
59	63.3	50.2	0.6	5.9	17.9	54.5	19.9	1.2
60	63.4	50.3	0.6	5.8	17.6	54.4	20.4	1.3
61	63.5	50.4	0.6	5.7	17.3	54.3	20.9	1.3
62	63.6	50.5	0.6	5.5	17.0	54.2	21.3	1.4
63	63.7	50.6	0.5	5.4	16.7	54.1	21.8	1.5
64	63.8	50.6	0.5	5.3	16.4	54.0	22.2	1.6
65	63.9	50.7	0.5	5.2	16.1	53.8	22.7	1.6
66	64.0	50.8	0.5	5.1	15.9	53.7	23.1	1.7
67	64.0	50.8	0.5	5.0	15.7	53.5	23.5	1.8
68	64.0	50.8	0.5	4.9	15.4	53.4	23.9	1.9
69	64.0	50.8	0.5	4.8	15.2	53.3	24.3	2.0
70	64.0	50.8	0.5	4.7	15.0	53.1	24.7	2.0
71	64.0	50.8	0.5	4.6	14.8	53.0	25.0	2.1
72	64.0	50.8	0.5	4.6	14.6	52.9	25.3	2.2
73	64.0	50.8	0.4	4.5	14.4	52.8	25.7	2.2
74	64.0	50.8	0.4	4.4	14.2	52.7	26.0	2.3
75	64.0	50.8	0.4	4.3	14.1	52.6	26.2	2.3
76	64.0	50.8	0.4	4.3	13.9	52.5	26.5	2.4
77	64.0	50.8	0.4	4.2	13.7	52.4	26.8	2.5
78	64.0	50.8	0.4	4.2	13.6	52.3	27.0	2.5
79	64.0	50.8	0.4	4.1	13.5	52.2	27.3	2.6
80	64.0	50.8	0.4	4.0	13.3	52.1	27.5	2.6
81	64.1	50.9	0.4	4.0	13.2	52.0	27.8	2.7
82	64.1	50.9	0.4	3.9	13.1	51.9	28.0	2.7
83	64.1	50.9	0.4	3.9	12.9	51.9	28.2	2.7
84	64.1	50.9	0.4	3.8	12.8	51.8	28.4	2.8
85	64.1	50.9	0.4	3.8	12.7	51.7	28.6	2.8
86	64.1	50.9	0.4	3.7	12.6	51.6	28.8	2.9
87	64.1	50.9	0.4	3.7	12.5	51.6	29.0	2.9
88	64.1	50.9	0.4	3.7	12.4	51.5	29.2	3.0
89	64.1	50.9	0.4	3.6	12.3	51.4	29.3	3.0
90	64.1	50.9	0.4	3.6	12.2	51.4	29.5	3.0
91	64.1	50.9	0.4	3.6	12.1	51.3	29.6	3.1
92	64.1	50.9	0.3	3.5	12.0	51.2	29.8	3.1
93	64.1	50.9	0.3	3.5	11.9	51.2	29.9	3.1
94	64.1	50.9	0.3	3.4	11.9	51.1	30.1	3.2
95	64.1	50.9	0.3	3.4	11.8	51.1	30.2	3.2

Table 25: Performance Of The Nick Chick Layer To 95 Weeks of Age

Age	Livability	Number of Eggs	Rate of Lay H. D.	Body Weight		Feed		Egg Weight in Week			Egg Weight Cumulative			Egg Mass			
				in g	in lbs	Bird / Day in g	100 / Day in lbs	g	Oz. / Doz	Net. lbs / 30 Doz. Case	g	Oz. / Doz.	Net. lbs / 30 Doz. Case	g / HD in week	Oz. / Doz. HD in week	cum. kg / HH	cum. lbs / HH
19	100.0	0.6	9.0	1329	2.93	79	17.5	40.6	17.2	32.2	40.6	17.2	32.2	3.7	1.5	0.03	0.1
20	99.9	2.8	31.0	1394	3.07	84	18.5	44.0	18.6	34.9	43.2	18.3	34.3	13.7	5.8	0.12	0.3
21	99.8	6.4	51.1	1439	3.17	91	20.0	46.3	19.6	36.7	45.0	19.0	35.7	23.7	10.0	0.29	0.6
22	99.7	11.2	69.2	1479	3.26	96	21.1	48.5	20.5	38.5	46.5	19.7	36.9	33.6	14.2	0.52	1.1
23	99.5	16.8	80.4	1514	3.34	99	21.7	50.5	21.4	40.1	47.8	20.2	38.0	40.6	17.2	0.80	1.8
24	99.4	23.0	88.6	1539	3.39	100	22.2	52.2	22.1	41.4	49.0	20.7	38.9	46.2	19.6	1.12	2.5
25	99.2	29.3	91.7	1559	3.44	100	22.2	54.0	22.9	42.9	50.1	21.2	39.7	49.5	21.0	1.47	3.2
26	99.1	35.8	93.3	1574	3.47	100	22.2	55.5	23.5	44.0	51.1	21.6	40.5	51.8	21.9	1.83	4.0
27	99.0	42.3	94.1	1584	3.49	100	22.2	56.5	23.9	44.8	51.9	22.0	41.2	53.2	22.5	2.20	4.8
28	98.9	48.9	94.7	1589	3.50	100	22.2	57.5	24.3	45.6	52.7	22.3	41.8	54.4	23.0	2.57	5.7
29	98.8	55.4	95.2	1594	3.51	100	22.2	58.0	24.6	46.0	53.3	22.6	42.3	55.2	23.4	2.95	6.5
30	98.7	62.0	95.5	1597	3.52	100	22.2	58.5	24.8	46.4	53.8	22.8	42.7	55.9	23.7	3.34	7.4
31	98.6	68.6	95.7	1600	3.53	100	22.2	58.8	24.9	46.6	54.3	23.0	43.1	56.2	23.8	3.73	8.2
32	98.5	75.3	95.9	1603	3.53	100	22.2	59.0	25.0	46.8	54.7	23.2	43.4	56.6	24.0	4.12	9.1
33	98.4	81.9	96.1	1606	3.54	100	22.2	59.3	25.1	47.0	55.1	23.3	43.7	56.9	24.1	4.51	9.9
34	98.3	88.5	96.2	1609	3.55	100	22.2	59.5	25.2	47.2	55.4	23.5	44.0	57.2	24.2	4.90	10.8
35	98.2	95.1	96.3	1612	3.55	100	22.2	59.8	25.3	47.4	55.7	23.6	44.2	57.5	24.4	5.30	11.7
36	98.1	101.7	96.4	1615	3.56	100	22.2	60.0	25.4	47.6	56.0	23.7	44.4	57.8	24.5	5.70	12.6
37	98.0	108.3	96.4	1618	3.57	100	22.2	60.2	25.5	47.7	56.3	23.8	44.6	58.0	24.5	6.09	13.4
38	97.9	114.9	96.4	1621	3.57	100	22.2	60.3	25.5	47.9	56.5	23.9	44.8	58.1	24.6	6.49	14.3
39	97.8	121.5	96.5	1624	3.58	100	22.2	60.5	25.6	48.0	56.7	24.0	45.0	58.3	24.7	6.89	15.2
40	97.7	128.1	96.5	1626	3.58	100	22.2	60.6	25.7	48.1	56.9	24.1	45.2	58.4	24.7	7.29	16.1
41	97.6	134.7	96.4	1628	3.59	100	22.2	60.8	25.7	48.2	57.1	24.2	45.3	58.6	24.8	7.69	17.0
42	97.5	141.3	96.4	1630	3.59	100	22.2	60.9	25.8	48.3	57.3	24.2	45.4	58.7	24.9	8.09	17.8
43	97.4	147.9	96.4	1632	3.60	100	22.2	61.1	25.8	48.5	57.4	24.3	45.6	58.8	24.9	8.49	18.7
44	97.3	154.4	96.3	1634	3.60	100	22.2	61.2	25.9	48.6	57.6	24.4	45.7	59.0	25.0	8.89	19.6
45	97.2	161.0	96.3	1636	3.61	100	22.2	61.4	26.0	48.7	57.7	24.4	45.8	59.1	25.0	9.29	20.5
46	97.1	167.5	96.2	1638	3.61	100	22.2	61.5	26.0	48.8	57.9	24.5	45.9	59.2	25.0	9.70	21.4
47	97.0	174.0	96.1	1640	3.62	100	22.2	61.7	26.1	48.9	58.0	24.6	46.1	59.3	25.1	10.10	22.3
48	96.9	180.5	96.0	1642	3.62	100	22.2	61.8	26.2	49.0	58.2	24.6	46.2	59.3	25.1	10.50	23.2
49	96.8	187.0	95.9	1644	3.62	100	22.2	62.0	26.2	49.2	58.3	24.7	46.3	59.4	25.1	10.90	24.0
50	96.7	193.5	95.7	1646	3.63	100	22.2	62.1	26.3	49.3	58.4	24.7	46.4	59.5	25.2	11.31	24.9
51	96.6	200.0	95.6	1648	3.63	100	22.2	62.3	26.3	49.4	58.6	24.8	46.5	59.5	25.2	11.71	25.8
52	96.5	206.4	95.4	1650	3.64	100	22.2	62.4	26.4	49.5	58.7	24.8	46.6	59.5	25.2	12.11	26.7
53	96.4	212.8	95.2	1652	3.64	100	22.2	62.6	26.5	49.6	58.8	24.9	46.7	59.5	25.2	12.51	27.6
54	96.3	219.2	94.9	1654	3.65	100	22.2	62.7	26.5	49.8	58.9	24.9	46.7	59.5	25.2	12.91	28.5
55	96.2	225.6	94.7	1656	3.65	100	22.2	62.9	26.6	49.9	59.0	25.0	46.8	59.5	25.2	13.31	29.3
56	96.1	231.9	94.4	1658	3.66	100	22.2	63.0	26.7	50.0	59.1	25.0	46.9	59.5	25.2	13.71	30.2
57	96.0	238.2	94.1	1660	3.66	100	22.2	63.1	26.7	50.1	59.2	25.1	47.0	59.4	25.1	14.11	31.1

Table 25: Performance of the H&N "Nick Chick" Layer to 95 Weeks of Age

Age	Livability	Number of Eggs	Rate of Lay H. D.	Body Weight		Feed		Egg Weight in Week			Egg Weight Cumulative			Egg Mass			
				in g	in lbs	Bird / Day in g	100 / Day in lbs	g	Oz. / Doz	Net. lbs / 30 Doz. Case	g	Oz. / Doz.	Net. lbs / 30 Doz. Case	g / HD in week	Oz. / Doz. HD in week	cum. kg / HH	cum. lbs / HH
58	95.9	244.5	93.8	1662	3.66	100	22.2	63.2	26.8	50.2	59.3	25.1	47.1	59.3	25.1	14.51	32.0
59	95.8	250.8	93.5	1664	3.67	100	22.2	63.3	26.8	50.2	59.4	25.2	47.2	59.2	25.0	14.91	32.9
60	95.7	257.0	93.1	1666	3.67	100	22.2	63.4	26.8	50.3	59.5	25.2	47.2	59.0	25.0	15.30	33.7
61	95.6	263.2	92.7	1668	3.68	100	22.2	63.5	26.9	50.4	59.6	25.2	47.3	58.9	24.9	15.69	34.6
62	95.5	269.4	92.3	1670	3.68	100	22.2	63.6	26.9	50.5	59.7	25.3	47.4	58.7	24.8	16.09	35.5
63	95.4	275.5	91.9	1672	3.69	100	22.2	63.7	27.0	50.6	59.8	25.3	47.5	58.5	24.8	16.48	36.3
64	95.3	281.6	91.4	1674	3.69	100	22.2	63.8	27.0	50.6	59.9	25.3	47.5	58.3	24.7	16.87	37.2
65	95.2	287.7	91.0	1676	3.69	100	22.2	63.9	27.0	50.7	60.0	25.4	47.6	58.1	24.6	17.25	38.0
66	95.1	293.7	90.5	1678	3.70	100	22.2	64.0	27.1	50.8	60.1	25.4	47.7	57.9	24.5	17.64	38.9
67	95.0	299.7	90.0	1680	3.70	100	22.2	64.0	27.1	50.8	60.1	25.5	47.7	57.6	24.4	18.02	39.7
68	94.9	305.6	89.5	1682	3.71	100	22.2	64.0	27.1	50.8	60.2	25.5	47.8	57.3	24.3	18.40	40.6
69	94.8	311.5	89.1	1684	3.71	100	22.2	64.0	27.1	50.8	60.3	25.5	47.8	57.0	24.1	18.78	41.4
70	94.7	317.4	88.5	1686	3.72	100	22.2	64.0	27.1	50.8	60.4	25.5	47.9	56.7	24.0	19.16	42.2
71	94.6	323.2	88.0	1688	3.72	100	22.2	64.0	27.1	50.8	60.4	25.6	48.0	56.3	23.8	19.53	43.1
72	94.5	329.0	87.4	1690	3.73	100	22.2	64.0	27.1	50.8	60.5	25.6	48.0	56.0	23.7	19.90	43.9
73	94.4	334.7	86.8	1692	3.73	100	22.2	64.0	27.1	50.8	60.5	25.6	48.0	55.6	23.5	20.27	44.7
74	94.3	340.4	86.2	1694	3.73	100	22.2	64.0	27.1	50.8	60.6	25.7	48.1	55.2	23.4	20.63	45.5
75	94.2	346.1	85.6	1696	3.74	100	22.2	64.0	27.1	50.8	60.7	25.7	48.1	54.8	23.2	20.99	46.3
76	94.1	351.7	84.8	1698	3.74	100	22.2	64.0	27.1	50.8	60.7	25.7	48.2	54.3	23.0	21.35	47.1
77	94.0	357.2	84.1	1700	3.75	100	22.2	64.0	27.1	50.8	60.8	25.7	48.2	53.8	22.8	21.70	47.8
78	93.9	362.7	83.3	1702	3.75	100	22.2	64.0	27.1	50.8	60.8	25.7	48.3	53.3	22.6	22.05	48.6
79	93.8	368.1	82.4	1704	3.76	100	22.2	64.0	27.1	50.8	60.9	25.8	48.3	52.8	22.3	22.40	49.4
80	93.7	373.4	81.5	1705	3.76	100	22.2	64.0	27.1	50.8	60.9	25.8	48.3	52.2	22.1	22.74	50.1
81	93.6	378.7	80.5	1706	3.76	100	22.2	64.1	27.1	50.9	60.9	25.8	48.4	51.6	21.8	23.08	50.9
82	93.5	383.9	79.5	1707	3.76	100	22.2	64.1	27.1	50.9	61.0	25.8	48.4	51.0	21.6	23.41	51.6
83	93.4	389.0	78.6	1708	3.77	100	22.2	64.1	27.1	50.9	61.0	25.8	48.4	50.4	21.3	23.74	52.3
84	93.3	394.1	77.6	1709	3.77	100	22.2	64.1	27.1	50.9	61.1	25.9	48.5	49.7	21.0	24.07	53.1
85	93.2	399.1	76.6	1710	3.77	100	22.2	64.1	27.1	50.9	61.1	25.9	48.5	49.1	20.8	24.39	53.8
86	93.1	404.0	75.6	1711	3.77	100	22.2	64.1	27.1	50.9	61.1	25.9	48.5	48.4	20.5	24.70	54.5
87	93.0	408.9	74.6	1712	3.77	100	22.2	64.1	27.1	50.9	61.2	25.9	48.6	47.8	20.2	25.01	55.1
88	92.9	413.6	73.6	1713	3.78	100	22.2	64.1	27.1	50.9	61.2	25.9	48.6	47.2	20.0	25.32	55.8
89	92.8	418.3	72.6	1714	3.78	100	22.2	64.1	27.1	50.9	61.2	25.9	48.6	46.5	19.7	25.62	56.5
90	92.7	423.0	71.6	1715	3.78	100	22.2	64.1	27.1	50.9	61.3	25.9	48.6	45.9	19.4	25.92	57.1
91	92.6	427.6	70.6	1716	3.78	100	22.2	64.1	27.1	50.9	61.3	26.0	48.7	45.2	19.2	26.21	57.8
92	92.5	432.1	69.6	1717	3.79	100	22.2	64.1	27.1	50.9	61.3	26.0	48.7	44.6	18.9	26.50	58.4
93	92.4	436.5	68.6	1718	3.79	100	22.2	64.1	27.1	50.9	61.4	26.0	48.7	44.0	18.6	26.79	59.1
94	92.3	440.9	67.6	1719	3.79	100	22.2	64.1	27.1	50.9	61.4	26.0	48.7	43.3	18.3	27.07	59.7
95	92.2	445.2	66.6	1720	3.79	100	22.2	64.1	27.1	50.9	61.4	26.0	48.7	42.7	18.1	27.34	60.3

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