BROWN NICK

Brown Egg Layers

H&N® INTERNATIONAL

The key to your profit!

Management *Guide*

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 "Brown Nick" 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 "Brown Nick" 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 "Brown Nick" layer flocks.

One should never accept average or below average performance. Obtaining optimum performance from each of the birds in the flock helps 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: Brown Nick Performance Specifications

Liveability	**0 – 19 weeks: 96 – 98 %**		**19 – 95 weeks: 90 – 95 %**
Egg Production	Age at 50 % Hen-Day Production 4 wk Peak Hen-Housed Performance to 60 wk Hen-Housed Performance to 80 wk Hen-Housed Performance to 95 wk Period over 90 % Period over 80 %		142 – 152 Days 94 – 95 % 250 – 255 eggs (254 eggs) 355 – 360 eggs (359 eggs) 420 – 425 eggs (424 eggs) 28 weeks 65 weeks
Feed	Period (weeks)	Conversion (kg Feed / kg Eggs)	Consumption (g / bird / day)
	19–60 19–80 19–95	2.07 2.11 2.17	112–117 113–118 113–118
Body Size	Age (weeks)	Weight (kg)	
	19 60 80 95	1.559 2.009 2.050 2.080	
Egg Weight	Age (weeks)	g / Egg	Cumulative Egg Mass (kg)
	25 30 35 40 60 80 95 19–95	57–58 60–61 62–63 63–64 66–67 68–69 68–69 62–65	1.77 3.74 5.79 7.85 15.81 22.84 27.34 27.34

The data contained in this guide is based on our most recent research and field information. The specifications listed for the "Brown Nick" are obtainable under proper management and environmental conditions. This is not a warranty or guarantee of performance.

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BROODING AND REARING PROGRAM

Goals of Management

The goal of management is to produce pullets which, at 18 weeks of age, are properly conditioned to make the transition to excellent layers. Proper condition is defined as:

- 1400–1550 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 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 disease. 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. 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 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 the poultry houses. Do not allow drivers of off-farm vehicles to enter any poultry houses.

Humidity

Humidity is an important aspect of successful brooding. The relative humidity (determined with a wet bulb thermometer) should be maintained between 60 and 70 %. 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.

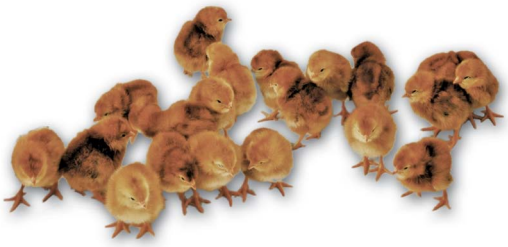
Water

Chicks must have access to plenty of clean, fresh, cool water. 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 1. 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.

Table 1: Water Consumption of Pullets*

Water Consumed / 1000 birds / day		
Age (Week)	21 °C Liter	32 °C Liter
2	30	35
4	77	118
6	101	169
8	118	196
10	125	216
12	134	224
14	139	232
16	144	240
18	148	246

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



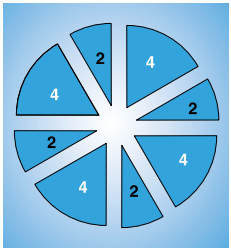
Feed

An optimal feed is a very homogenous mash feed. If this is not available, crumbles are better than a sub-optimal mash for early growth.

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 irregular. 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 special designed intermittent lighting program. The target is to synchronize the chicks' activities. The farmer gets a better impression on the flock's condition, the birds are pushed by the groups 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.

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 weak 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.

FLOOR BROODING AND REARING

Brooder

Get the chicks off to a good start by using good quality, clean litter. Have the brooder house ready and start the heating system 24 hours prior to the arrival of the chicks.

Floor Space

Because of today's high energy costs, some egg-type birds in colder climates are being brooded in "half-house brooding". This is done by partitioning the brooder house with a temporary barrier at one-half the length of the house and having all chicks brooded in the smaller area until supplementary heat can be shut off. The other half of the house is then opened to the chicks. Be sure to provide the floor space recommended.

Built-up Litter

The use of old litter is not recommended. With old litter, the disease load can be increased and may cause the chicks to have increased morbidity or mortality.

Feed and Water

Supplemental feeder trays should be provided within the brooder ring for a few days until all chicks are eating from the regular feed system. Be sure that adequate feeder space

is provided. Insoluble grit should be fed if the chicks are on a type of litter (e.g. shavings) that will be eaten by the chicks.

Automatic watering systems vary in their ability to provide adequate water for day old chicks. Almost all systems should be supplemented with water jugs until the chicks are drinking from the regular water system.

It is important that birds are grown on exactly the same type water system as they will use in the laying house. This will help prevent dehydration at housing time.

Chick Guards

When using canopy type brooders, use chick guards (new cardboard, or other material) to stop drafts. Start with about a 2 meter diameter in cool weather and about 4 meter diameter in hot weather. Enlarge the ring every couple of days and remove by six or seven days of age.

Coccidiosis Control

Good litter management will aid in the prevention of an outbreak of coccidiosis. If the birds will go to cages, the use of a coccidiostat for prevention is recommended. If the birds are going to the floor, then a vaccination program must be used that creates immunity in the birds. Coccidiostats will generally not be used during the lay cycle.

CAGE BROODING AND REARING

Water

The proper drinker space (Figure 2) 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.**

Figure 2: 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* 1.25 cm*
Floor Brood Grow	100 100		25 15		24 25	2.5 cm* 2.5 cm*

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

Feed

Start the day old chicks on crinkled paper or newspaper, not slick colored advertisement sheets, laid over the wire floor. 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 (Figure 3) to assure proper growth and uniformity.

Figure 3: Feeder Space Requirements in the Brooding and Growing Periods

Cage	
Brood/Grow	5 cm / bird
Floor	
Brood/Grow	7.5 cm / bird 25 birds / pan feeder

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 (Figure 4).

Figure 4: Floor Space Requirements in the Brooding and Growing Periods

Cage	
Brood	142 sq. cm / bird
Grow	284 sq. cm / bird
Floor Open-Type Housing	
Brood	13.4 birds / square meter
Grow	7.2 birds / square meter
Floor Controlled Environment	
Brood	21.5 birds / square meter
Grow	10.8 birds / square meter

Temperature

The day before the chicks arrive, heat the building to the temperature specified in this guide (Figure 5).

Figure 5: Temperature Requirements in the Brooding and Growing Periods

Start		
Cage	34 °C – 35 °C*	Reduce 3 °C each week until supplementary heat is no longer needed
Floor	35 °C – 36 °C*	Reduce 3 °C each week until supplementary heat is no longer needed

* At chick level

Light

Be sure sufficient light intensity (10 – 20 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 and 41.0 °C 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 fecal 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

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.

Infra-Red Beak Treatment of Day Old Chicks

With the latest developed techniques (infra-red technology) beak treatment already can be applied to day old chicks in the hatchery. This procedure should be done under very hygienic conditions by specially trained personnel. It is recommended to treat the chicks adjusted to the age of the PS flock, the chick size and breed.

7–10 Days Beak Treatment

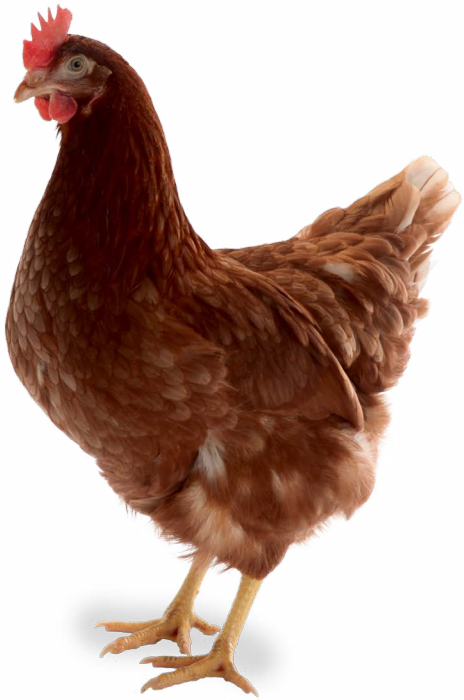
The conventional method of beak treatment is to treat the beaks with a hot blade. Since pullets are reaching sexual maturity at an earlier age, it is best to beak treat at a young age. This will allow sufficient time for the pullets to recover from any body weight loss that may occur. For this reason 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, 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.

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.

Please keep in mind that country-specific regulations should be obsereved.

FEEDING PULLETS

The H&N "Brown Nick" will grow and develop properly on feeding programs and diets provided by various feed suppliers. The recommended nutrient levels in Table 2 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, therefore, generally 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 "Brown Nick". 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 2: Recommended Nutrient Density in the Brood / Grow / Pre-lay Diets

Nutrient	Diet type			
	Starter* 0–3 wk until 0.19 kg BW	Grower 4–8 wk until 0.70 kg BW	Developer 9–17 wk until 1.40 kg BW	Pre-lay (optional) 17 wk–5 % prod.
Energy (kcal / kg**) Energy (MJ)	2900 12.00	2750 – 2800 11.40	2750 – 2800 11.40	2750 – 2800 11.40
Protein (%)	20.00	18.50	14.50	17.50
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	0.65	0.85
Dig. Lysine (%)	0.98	0.82	0.53	0.70
Valin (%)	0.89	0.75	0.53	0.64
Dig. Valin (%)	0.76	0.64	0.46	0.55
Tryptophan (%)	0.23	0.21	0.16	0.20
Dig. Tryptothan (%)	0.19	0.17	0.13	0.16
Threonine (%)	0.80	0.70	0.50	0.60
Dig. Threonin (%)	0.65	0.57	0.40	0.49
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	2.00
Phosphorus 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
Chloride (%)	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

Pre-lay feed should be used for a short period of time before a flock starts being supplied with Phase 1 layer feed. This leads to a smooth transition from the developer feed (low calcium and low nutrient density) to a diet with high calcium and nutrient levels. It helps to avoid the often reduced daily feed intake during early production. Pre-lay feed has proven to be a very good tool in supporting the optimal nutrition of a layer flock.

Typically, pre-lay feed contains about 2.0 – 2.5 % calcium. This is too much for a typical feed for rearing but not enough for a bird starting to produce eggs. From a nutritional point of view, it is therefore considered a compromise and never as "optimal" feed. Nevertheless, it is worthwhile to use pre-lay feed for a short period of time. Correct use can enhance the uniformity of a pullet flock. It is especially beneficial for flocks with very low uniformity and also aids the development of Ca-metabolism in medullary bones. Since pre-lay feed is a compromise feed for the short transition period, it cannot supply a bird in full lay sufficiently. Therefore, it cannot be used when feed logistics and correct timing do not work. The wrong way to use pre-lay feed is to either use it too early and / or too long.

When birds mature, body weight and water intake increase slightly and the farm manager will then classify them as "ready to go". This type of feed can be used for a short and appropriate period of time.

Use pre-lay feed for about 10 days with a maximum of 1 kg per bird. If birds have to be transferred earlier than 17 weeks of age from rearing to the layer farm, do not use a pre-lay diet in the rearing facility. Instead, use the following guidelines:

Table 3: Feeding during and after Transfer

Age at Transfer		Feeding Program		
		Developer Feed	Followed by	Pre-lay Feed
week	days	kg feed	→	kg feed
15	105	1.0	→	1.0
16	112	0.5	→	1.0
17	119	–	→	1.0
18	126	–	→	0.5
after 18	after 126	immediately supply layer Phase-1-feed		

Feed Consumption

The data of Table 5 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

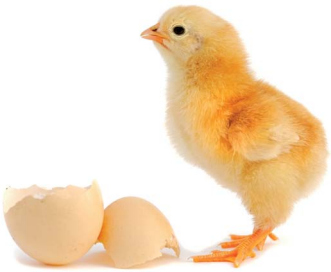
Use only fresh feed that is free from chemical and microbial contaminants. Take an appropriate sample of every load of each ingredient if the operation has its own feed mill. If the operation does not have its own feed mill a sample of each load of mixed feed should be taken. Store these samples for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

Table 4: Recommended Vitamin and Mineral Additions to the Finished Diets

Supplements per kg Feed		Starter / Grower	Developer	Pre-lay / Layer
Vitamin A*	IU	10000	10000	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	15	15	15
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
Antioxydant	mg	100–150***	100–150***	100–150***
Coccidiostat		as required	as required	–
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	0.25	0.25	0.25

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

Vitamin C is synthesized by poultry normally. This vitamin is not considered as essential, but in some circumstances, like heat stress or hot climate it may be important / beneficial to add 100–200 mg / kg complete feed during production period.



* Higher level might be possible according to local state and national regulations.
** So called "organic sources" should be considered with higher bioavailability.
*** according to fat addition
**** double in case of heat treated feed

Table 5: Pullet Feed Consumption

Diet	Week of Life	Daily g / day	cumul. (g / bird)
Starter	1	10	70
	2	16	182
	3	22	336
Grower	4	28	532
	5	34	770
	6	40	1050
	7	46	1372
	8	52	1736
Developer	9	57	2135
	10	61	2562
	11	64	3010
	12	66	3472
	13	67	3941
	14	68	4417
	15	70	4907
	16	72	5411
Pre-lay	17	74	5929
	18	76	6461
	19	80	7021
	20	90	7651

Feeding 0 – 3 Weeks – Starter Period (0 – 21 days)

Research has shown that the "Brown Nick" will grow properly the first 3 weeks on a starter feed that meets the nutrient specifications in Table 2.

Feeding Week 4 – Housing (22 – 126 days)

The "Brown Nick" will develop and mature satisfactorily on a variety of feeding programs, but our research indicates that a change to a grower ration at 4 weeks of age and a developer ration at 9 weeks of age works best in temperate climates. In tropical climates, feeding a starter ration to 4 weeks of age or longer may be necessary in order to achieve target body weights (see Table 5a, "Body Weight Goal Chart").

It is essential that the body weight of the "Brown Nick" has to be checked weekly. Maintaining the proper body weight during the grow period will help the "Brown Nick" perform to its genetic potential.

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 "Brown Nick" body weight guide (Table 5a). If optimum performance is to be reached, pullet body weight must closely conform to the H&N guide. It is important with today's "Brown Nick" that the average body weight at 17 weeks be 1230 grams. The growth pattern should follow that shown in Table 5a.

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 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 2 and 5. If the flock is underweight, postpone any scheduled diet changes (e.g. from grower to developer) 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. However, the grower diet should not be given after 11 weeks of age.

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 or floor 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 18 to 24 °C, if possible.

Table 5a: Recommended "Brown Nick" Body Weight during the Brooding and Growing Periods

Age		Body Weight Goal
Week	Day	g
1	7	70
2	14	125
3	21	190
4	28	270
5	35	363
6	42	472
7	49	583
8	56	684
9	63	783
10	70	876
11	77	962
12	84	1048
13	91	1129
14	98	1201
15	105	1269
16	112	1334
17	119	1404
18	126	1479
19	133	1559
20	140	1645

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, the date of vaccination, method, reaction observed (if any) and any medication currently in use.
- **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 2.4 kg / 1000 liters 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.
- **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 medications and antibiotics** for three days preceding and at least one week after vaccination, so as not to interfere with the immune response.
- **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 submits 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 (Figure 6) is intended as a very general guideline for vaccinations which are needed on most farms worldwide. Additional vaccinations for coccidiosis, infectious laryngotrachitis, 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.

Figure 6: Sample Vaccination Program

Age	Type
Hatch Day	Marek's Disease
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)
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 cage and/or pen counts of the number of birds present in the flock are very important.

LIGHTING PROGRAM TO 18 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 "Brown Nick" 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 and the intensity should be 10 Lux. On day 3, reduce the duration of the light to 16 hours per day and maintain the intensity at 5 – 7.5 Lux.

Brooding and Growing in Closed Housing (Light Tight)

At the beginning of the third week (15 days of age), reduce the duration of light to nine or ten hours. The intensity should be 5 – 7.5 Lux. Retain this duration until 17 weeks (119 days of age). At 18 weeks of age increase to 13 hours. Thereafter increase one hour per week until the maximum daylength (e.g. 16 hours) is reached. Light intensity should be as shown in Table 6.

Table 6: Minimum Light Intensity

Age		
Week	Days	Lux
0 – 2	1 – 14	10
2 – 18	15 – 126	5 – 7.5
18 – End of Lay	126 – End of Lay	10–20

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 7) 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 18 weeks of age and at the proper body weight, the length of day needs to be increased by at least one hour (Table 9). The result must be 13 hours or more. Additional stimulations of one-half hour per week need to be given to increase the total hours of light to 16 hours.

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 7: 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	22	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

Table 8: Step-down Lighting Schedule

Natural Daylength at 17 Weeks of Age (hr)	Incremental Decrease (min)	Starting Age (wk)	Step-Down Frequency of Change (day)
10	30	10	7
11	30	12	7
12	15	10	7
13	15	10	14
14	None		

Table 9: Lighting during Lay

Age		Light
week	days	hours
18	126	13 or more
19	133	13 ½ or more
21	140	14 or more
22	147	14 ½ or more
23	154	15 or more
24	161	15 ½ or more
25	168	16 or more

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. H&N "Brown Nicks" also react very well to the stimulation of the increase in light intensity at 17 weeks of age. A minimum of 10 Lux in cages / 20 Lux in floor housing 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 (Table 6).

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 350 square 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.

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 10 cm of access to the feed trough. Provide a minimum of one cup or nipple waterer at the cage partition or 2.5 cm of water trough per bird.

Temperature Control

Laying hens perform well over a wide range of temperatures. Temperature changes between 21 and 27 °C have a minimal effect on egg production, egg size and shell quality. Feed conversion improves with higher house temperatures, and maximum efficiency is attained in the 21 – 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. For more information contact H&N International.

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.

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 "Brown Nicks" 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.

Anyhow H&N birds are selected for a high egg production and due to their high turnover rates of feed into egg, they have a big demand for nutrients. Therefore they should be supplied Ad Libitum at all times with the feed.

Feeding at Onset of Production and Through Peak

At 5 % 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 (such as Lay 90, Table 10). Recommended vitamin and trace mineral levels are found in Table 4.

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 10 through 14. After peak (about 36 weeks of age) change the diet a couple weeks after production has gone below the next 5 % production level.

If the rate of lay stays above the laying standard, do not change the diet, continue to use the higher density feed.

Table 10: Nutrient Levels of Diets for Production above 90 % at Various Feed Intakes to Provide the Recommended Daily Nutrient Intake

G / bird / day:	100	105	110	115	120
Energy (kcal / kg*) Energy (MJ)	3000 12.4	2800 11.6	2750 11.4	2750 11.4	2750 11.4
Protein (%)	18.80	17.90	17.09	16.35	15.67
Calcium (%)	4.10	3.90	3.73	3.57	3.42
Phosphorus (%)**	0.60	0.57	0.55	0.52	0.50
Av. Phosphorus (%)**	0.42	0.40	0.38	0.37	0.35
Sodium (%)	0.18	0.17	0.16	0.16	0.15
Chlorine (%)	0.18	0.17	0.16	0.16	0.15
Lysine (%)	0.88	0.84	0.80	0.76	0.73
Dig. Lysine (%)	0.72	0.69	0.65	0.63	0.60
Methionine (%)	0.44	0.42	0.40	0.38	0.37
Dig. Methionine (%)	0.36	0.34	0.33	0.31	0.30
Met. + Cys. (%)	0.80	0.76	0.73	0.69	0.67
Dig. Met. + Cys. (%)	0.66	0.62	0.60	0.57	0.55
Arginine (%)	0.91	0.87	0.83	0.80	0.76
Dig. Arginine (%)	0.75	0.71	0.68	0.65	0.63
Valine (%)	0.74	0.71	0.67	0.64	0.62
Dig. Valine (%)	0.63	0.60	0.57	0.55	0.53
Tryptophane (%)	0.18	0.17	0.17	0.16	0.15
Dig. Tryptophane (%)	0.15	0.14	0.14	0.13	0.13
Threonine (%)	0.61	0.58	0.55	0.53	0.51
Dig. Threonine (%)	0.50	0.48	0.45	0.43	0.42
Isoleucine (%)	0.70	0.66	0.63	0.60	0.58
Dig. Isoleucine (%)	0.57	0.54	0.52	0.50	0.48
Linoleic acid (%)	2.00	1.90	1.82	1.74	1.67

* A nutritionist should be consulted if the energy levels are above 1370 or below 1240 kcal / lb (2980 or below 2755 kcal / kg).
** without phytase

Table 11: Nutrient Levels of Diets for Production between 85 and 90 % at Various Feed Intakes to Provide the Recommended Daily Nutrient Intake

G / bird / day:	100	105	110	115	120
Energy (kcal / kg*) Energy (MJ)	3000 12.4	2800 11.6	2750 11.4	2750 11.4	2750 11.4
Protein (%)	18.27	17.40	16.61	15.89	15.23
Calcium (%)	4.10	3.90	3.73	3.57	3.42
Phosphorus (%)**	0.58	0.56	0.53	0.51	0.49
Av. Phosphorus (%)**	0.41	0.39	0.37	0.35	0.34
Sodium (%)	0.17	0.17	0.16	0.15	0.15
Chlorine (%)	0.17	0.17	0.16	0.15	0.15
Lysine (%)	0.85	0.81	0.78	0.74	0.71
Dig. Lysine (%)	0.70	0.67	0.64	0.61	0.58
Methionine (%)	0.43	0.41	0.39	0.37	0.36
Dig. Methionine (%)	0.35	0.33	0.32	0.30	0.29
Met. + Cys. (%)	0.78	0.74	0.71	0.68	0.65
Dig. Met. + Cys. (%)	0.64	0.61	0.58	0.55	0.53
Arginine (%)	0.89	0.85	0.81	0.77	0.74
Dig. Arginine (%)	0.73	0.69	0.66	0.63	0.61
Valine (%)	0.72	0.69	0.65	0.63	0.60
Dig. Valine (%)	0.61	0.58	0.56	0.53	0.51
Tryptophane (%)	0.18	0.17	0.16	0.15	0.15
Dig. Tryptophane (%)	0.15	0.14	0.13	0.13	0.12
Threonine (%)	0.59	0.56	0.54	0.52	0.49
Dig. Threonine (%)	0.49	0.46	0.44	0.42	0.41
Isoleucine (%)	0.68	0.64	0.61	0.59	0.56
Dig. Isoleucine (%)	0.55	0.53	0.50	0.48	0.46
Linoleic acid (%)	2.00	1.90	1.82	1.74	1.67

* A nutritionist should be consulted if the energy levels are above 1370 or below 1240 kcal / lb (2980 or below 2755 kcal / kg).
** without phytase

Table 12: Nutrient Levels of Diets for Production between 80 and 85 % at Various Feed Intakes to Provide the Recommended Daily Nutrient Intake

G / bird / day:	100	105	110	115	120
Energy (kcal / kg*) Energy (MJ)	3000 12.4	2800 11.6	2750 11.4	2750 11.4	2750 11.4
Protein (%)	17.75	16.90	16.13	15.43	14.79
Calcium (%)	4.20	4.00	3.82	3.65	3.50
Phosphorus (%)**	0.57	0.54	0.51	0.49	0.47
Av. Phosphorus (%)**	0.40	0.38	0.36	0.34	0.33
Sodium (%)	0.17	0.16	0.15	0.15	0.14
Chlorine (%)	0.17	0.16	0.15	0.15	0.14
Lysine (%)	0.83	0.79	0.75	0.72	0.69
Dig. Lysine (%)	0.68	0.65	0.62	0.59	0.57
Methionine (%)	0.41	0.39	0.38	0.36	0.35
Dig. Methionine (%)	0.34	0.32	0.31	0.30	0.28
Met. + Cys. (%)	0.75	0.72	0.69	0.66	0.63
Dig. Met. + Cys. (%)	0.62	0.59	0.56	0.54	0.52
Arginine (%)	0.86	0.82	0.78	0.75	0.72
Dig. Arginine (%)	0.71	0.67	0.64	0.62	0.59
Valine (%)	0.70	0.67	0.64	0.61	0.58
Dig. Valine (%)	0.59	0.57	0.54	0.52	0.50
Tryptophane (%)	0.17	0.16	0.16	0.15	0.14
Dig. Tryptophane (%)	0.14	0.13	0.13	0.12	0.12
Threonine (%)	0.58	0.55	0.52	0.50	0.48
Dig. Threonine (%)	0.47	0.45	0.43	0.41	0.39
Isoleucine (%)	0.66	0.62	0.60	0.57	0.55
Dig. Isoleucine (%)	0.54	0.51	0.49	0.47	0.45
Linoleic acid (%)	1.80	1.71	1.64	1.57	1.50

* A nutritionist should be consulted if the energy levels are above 1370 or below 1240 kcal / lb (2980 or below 2755 kcal / kg).
** without phytase

Table 13: Nutrient Levels of Diets for Production between 75 and 80 % at Various Feed Intakes to Provide the Recommended Daily Nutrient Intake

G / bird / day:	100	105	110	115	120
Energy (kcal / kg*) Energy (MJ)	3000 12.4	2800 11.6	2750 11.4	2750 11.4	2750 11.4
Protein (%)	17.22	16.40	15.66	14.97	14.35
Calcium (%)	4.20	4.00	3.82	3.65	3.50
Phosphorus (%)**	0.55	0.52	0.50	0.48	0.46
Av. Phosphorus (%)**	0.38	0.37	0.35	0.33	0.32
Sodium (%)	0.16	0.16	0.15	0.14	0.14
Chlorine (%)	0.16	0.16	0.15	0.14	0.14
Lysine (%)	0.80	0.77	0.73	0.70	0.67
Dig. Lysine (%)	0.66	0.63	0.60	0.57	0.55
Methionine (%)	0.40	0.38	0.37	0.35	0.34
Dig. Methionine (%)	0.33	0.31	0.30	0.29	0.27
Met. + Cys. (%)	0.73	0.70	0.67	0.64	0.61
Dig. Met. + Cys. (%)	0.60	0.57	0.55	0.52	0.50
Arginine (%)	0.84	0.80	0.76	0.73	0.70
Dig. Arginine (%)	0.69	0.65	0.62	0.60	0.57
Valine (%)	0.68	0.65	0.62	0.59	0.57
Dig. Valine (%)	0.58	0.55	0.52	0.50	0.48
Tryptophane (%)	0.17	0.16	0.15	0.15	0.14
Dig. Tryptophane (%)	0.14	0.13	0.12	0.12	0.11
Threonine (%)	0.56	0.53	0.51	0.49	0.47
Dig. Threonine (%)	0.46	0.44	0.42	0.40	0.38
Isoleucine (%)	0.64	0.61	0.58	0.55	0.53
Dig. Isoleucine (%)	0.52	0.50	0.47	0.45	0.44
Linoleic acid (%)	1.50	1.43	1.36	1.30	1.25

* A nutritionist should be consulted if the energy levels are above 1370 or below 1240 kcal / lb (2980 or below 2755 kcal / kg).
** without phytase

Table 14: Nutrient Levels of Diets for Production between 70 and 75 % at Various Feed Intakes to Provide the Recommended Daily Nutrient Intake

G / bird / day:	100	105	110	115	120
Energy (kcal / kg*) Energy (MJ)	3000 12.4	2800 11.6	2750 11.4	2750 11.4	2750 11.4
Protein (%)	16.71	15.92	15.19	14.53	13.93
Calcium (%)	4.30	4.10	3.91	3.74	3.58
Phosphorus (%)**	0.53	0.51	0.48	0.46	0.44
Av. Phosphorus (%)**	0.37	0.36	0.34	0.32	0.31
Sodium (%)	0.16	0.15	0.15	0.14	0.13
Chlorine (%)	0.16	0.15	0.15	0.14	0.13
Lysine (%)	0.78	0.74	0.71	0.68	0.65
Dig. Lysine (%)	0.64	0.61	0.58	0.56	0.53
Methionine (%)	0.39	0.37	0.35	0.34	0.33
Dig. Methionine (%)	0.32	0.30	0.29	0.28	0.27
Met. + Cys. (%)	0.71	0.68	0.65	0.62	0.59
Dig. Met. + Cys. (%)	0.58	0.55	0.53	0.51	0.49
Arginine (%)	0.81	0.77	0.74	0.71	0.68
Dig. Arginine (%)	0.67	0.64	0.61	0.58	0.56
Valine (%)	0.66	0.63	0.60	0.57	0.55
Dig. Valine (%)	0.56	0.53	0.51	0.49	0.47
Tryptophane (%)	0.16	0.15	0.15	0.14	0.14
Dig. Tryptophane (%)	0.13	0.13	0.12	0.12	0.11
Threonine (%)	0.54	0.52	0.49	0.47	0.45
Dig. Threonine (%)	0.44	0.42	0.40	0.39	0.37
Isoleucine (%)	0.62	0.59	0.56	0.54	0.51
Dig. Isoleucine (%)	0.51	0.48	0.46	0.44	0.42
Linoleic acid (%)	1.20	1.14	1.09	1.04	1.00

* A nutritionist should be consulted if the energy levels are above 1370 or below 1240 kcal / lb (2980 or below 2755 kcal / kg).
** without phytase

Table 15: Supply of Fine and Coarse Limestone

Feedtype	Fine Limestone	Coarse Limestone*
Layer Phase 1	35 %	65 %
Layer Phase 2	30 %	70 %
Layer Phase 3	25 %	75 %
Layer Phase 4 + 5	15 %	85 %

*can be partly replaced by oystershells

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 "Brown Nicks" 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, production feathering and environmental temperatures. Under normal conditions layers eat mainly to satisfy their energy requirement. In order to maintain an optimal laying persistency do not reduce the energy level below 2750 kcal / kg or 11.4 MJ / kg (energy calculation see 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. From 18 weeks of age to about 27 weeks of age (first week of peak) the taking of body weights may not give meaningful data because of the variable degree of sexual maturity between individuals. After about 27 weeks of age body weights should be taken every two weeks and compared to the goals (Table 16). The objective is for continued increases in egg weight and 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.

Table 16: Performance of the H&N "Brown Nick" Layer
to 95 Weeks of Age under Good Management and Moderate Environment

Age (wk)	Livability %	Hen Day %	Eggs / HH	Egg Wt. (g / egg)	Egg Mass (kg)	Body Wt. (g)
19	99.9	10.0	0.7	45.0	0.03	1559
20	99.9	45.0	3.9	47.5	0.18	1645
21	99.8	65.6	8.4	50.0	0.41	1716
22	99.7	80.7	14.1	52.0	0.70	1795
23	99.6	88.9	20.3	54.0	1.04	1835
24	99.5	92.5	26.7	56.0	1.40	1875
25	99.4	93.6	33.2	57.4	1.77	1890
26	99.3	94.3	39.8	58.5	2.16	1905
27	99.2	94.7	46.3	59.2	2.54	1910
28	99.1	95.0	52.9	59.9	2.94	1916
29	99.0	95.3	59.5	60.5	3.34	1921
30	98.9	95.5	66.1	61.0	3.74	1925
31	98.8	95.5	72.7	61.4	4.15	1928
32	98.7	95.5	79.3	61.8	4.56	1931
33	98.6	95.5	85.9	62.2	4.97	1934
34	98.5	95.4	92.5	62.5	5.38	1937
35	98.4	95.2	99.1	62.8	5.79	1940
36	98.3	95.0	105.6	63.1	6.20	1943
37	98.2	94.8	112.1	63.3	6.61	1946
38	98.1	94.6	118.6	63.5	7.03	1949
39	98.0	94.3	125.1	63.7	7.44	1952
40	97.9	94.1	131.5	63.9	7.85	1955
41	97.8	93.8	138.0	64.1	8.26	1958
42	97.7	93.5	144.4	64.2	8.67	1961
43	97.6	93.2	150.7	64.4	9.08	1964
44	97.5	92.9	157.1	64.5	9.49	1967
45	97.4	92.6	163.4	64.6	9.90	1970
46	97.3	92.2	169.7	64.7	10.30	1973
47	97.2	91.8	175.9	64.8	10.71	1976
48	97.1	91.5	182.1	64.9	11.11	1979
49	97.0	91.0	188.3	65.0	11.51	1982
50	96.9	90.6	194.4	65.1	11.91	1985
51	96.8	90.2	200.6	65.2	12.31	1988
52	96.7	89.7	206.6	65.3	12.71	1991
53	96.6	89.2	212.7	65.4	13.10	1994
54	96.5	88.8	218.7	65.5	13.50	1997
55	96.4	88.2	224.6	65.6	13.89	1999
56	96.3	87.7	230.5	65.7	14.28	2001
57	96.2	87.2	236.4	65.8	14.66	2003

Table 16: Performance of the H&N "Brown Nick" Layer
to 95 Weeks of Age under Good Management and Moderate Environment

Age (wk)	Livability %	Hen Day %	Eggs / HH	Egg Wt. (g / egg)	Egg Mass (kg)	Body Wt. (g)
58	96.1	86.6	242.2	65.9	15.05	2005
59	96.0	86.1	248.0	66.0	15.43	2007
60	95.9	85.6	253.8	66.1	15.81	2009
61	95.8	85.0	259.5	66.2	16.19	2011
62	95.7	84.5	265.1	66.3	16.56	2013
63	95.6	83.8	270.7	66.4	16.93	2015
64	95.5	83.2	276.3	66.5	17.30	2017
65	95.4	82.5	281.8	66.6	17.67	2019
66	95.3	81.9	287.3	66.7	18.03	2021
67	95.2	81.2	292.7	66.8	18.40	2023
68	95.1	80.6	298.0	66.9	18.75	2025
69	95.0	79.9	303.4	67.0	19.11	2027
70	94.9	79.3	308.6	67.1	19.46	2029
71	94.8	78.6	313.8	67.2	19.82	2031
72	94.7	78.0	319.0	67.3	20.16	2033
73	94.6	77.3	324.1	67.4	20.51	2035
74	94.5	76.7	329.2	67.5	20.85	2037
75	94.4	76.0	334.2	67.6	21.19	2039
76	94.3	75.3	339.2	67.7	21.53	2041
77	94.2	74.7	344.1	67.8	21.86	2043
78	94.1	74.0	349.0	67.9	22.19	2045
79	94.0	73.4	353.8	67.9	22.52	2048
80	93.9	72.7	358.6	68.0	22.84	2050
81	93.8	72.0	363.3	68.0	23.17	2052
82	93.7	71.3	368.0	68.1	23.48	2054
83	93.6	70.7	372.6	68.1	23.80	2056
84	93.5	70.0	377.2	68.2	24.11	2058
85	93.4	69.3	381.8	68.2	24.42	2060
86	93.3	68.6	386.2	68.3	24.73	2062
87	93.2	68.0	390.7	68.3	25.03	2064
88	93.1	67.3	395.1	68.4	25.33	2066
89	93.0	66.6	399.4	68.4	25.63	2068
90	92.9	65.9	403.7	68.5	25.92	2070
91	92.8	65.2	407.9	68.5	26.21	2072
92	92.7	64.6	412.1	68.6	26.50	2074
93	92.6	63.9	416.3	68.6	26.78	2076
94	92.5	63.2	420.3	68.7	27.07	2078
95	92.4	62.5	424.4	68.7	27.34	2080

PERFORMANCE IN THE LAY CYCLE

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

Laying Cycle Records

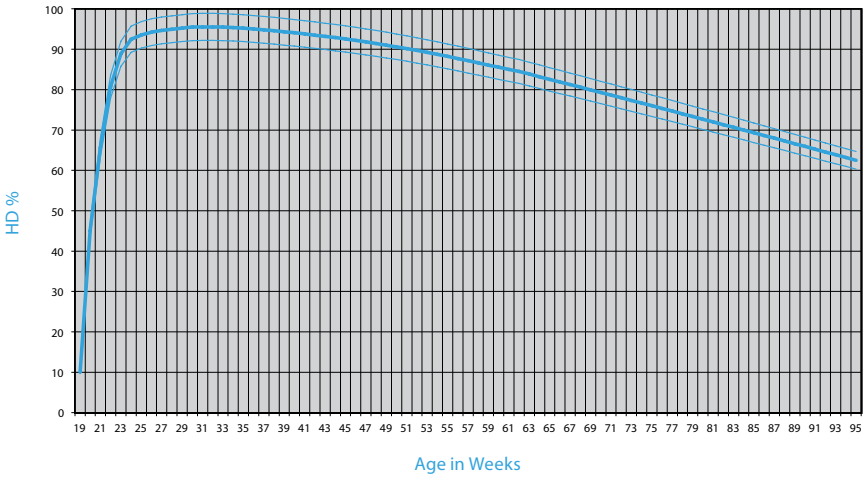
In order to evaluate performance and profitability, detailed laying cycle records are necessary. Daily figures for hen-day production, egg weight, feed and water consumption and mortality are necessary. This information will allow you to calculate very important data including daily egg mass, accumulative 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.

SUMMARY

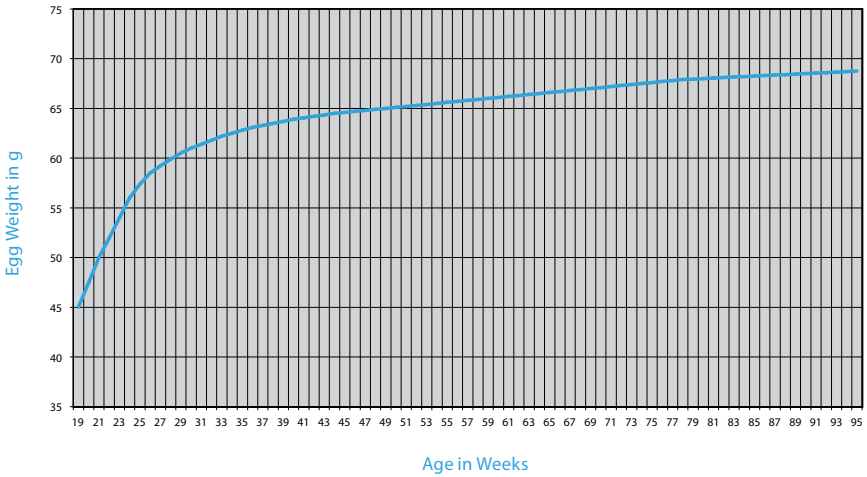
Sound management practices, based on successful field layer programs, have been outlined in this booklet. Followed carefully, they will help in the attainment of the maximum performance capabilities bred into the H&N "Brown Nick".

The above performance data are based on traditional cage management. Different management systems or poor environmental, feeding or management conditions could lead to considerable deviations in performance.

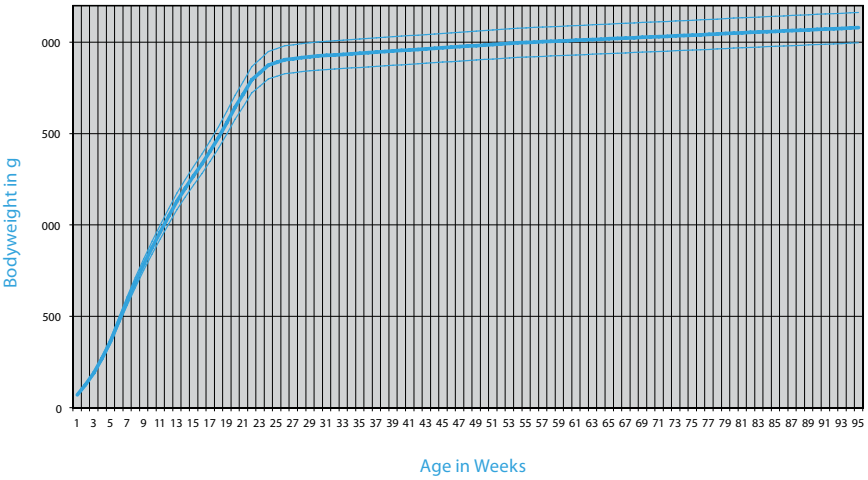
Brown Nick – Laying Performance



Brown Nick – Egg Weight



Brown Nick – Body Weight



DISCLAIMER

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How H&N International is calculating the energy content of feed and raw materials

(International WPSA – formula):

ME MJ / kg =	g crude protein	x 0.01551
	+ g crude fat	x 0.03431
	+ g crude starch	x 0.01669
	+ g sugar	x 0.01301 (as Saccharose)

ME = metabolizable energy in MJ / kg

1 Kcal = 4.187 kJ

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