BROWN NICK
NICK CHICK
SUPER NICK
CRYSTAL NICK

Parentstock
Layer Breeder

H&N® INTERNATIONAL

The key to your profit!

Management *Guide*

H&N 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 Parent Stock flocks.

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 Parent Stock flocks 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 Parent Stock 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.

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Figure A: "White Egg" Parent Stock Performance Specifications

Liveability	Growing Cycle (0 – 20 weeks): 96 – 98 %	Production Cycle (21 – 72 weeks): 88 – 92 %
Production to 72 Weeks	Total Eggs per Hen Housed Hatching Eggs per Hen Housed Age at 50 % Production Saleable Pullets per Hen Housed	305–310 (308.6) 279–284 (281.3) 145–155 days 113–118 (115.2)
Hatchability	Total hatch, peak Total Hatch, average Hatch of Saleable Pullets, peak Hatch of Saleable Pullets, average	96 % 89 % 44 % 40 %
Sex Determination	Feather sex progeny (please refer to feather sexing guide on page 42 of this guide)	
Female Body Weight	20 Weeks 40 Weeks 72 Weeks	1250–1380 grams 1560–1725 grams 1610–1780 grams
Male Body Weight	20 Weeks 40 Weeks 72 Weeks	1700 grams 2230 grams 2300 grams
Feed Consumption Including Males	Growing Cycle (0–20 Weeks) Production Cycle (21–72 Weeks)	7.4 kg 38.6 kg

Housing Requirements

Floor Space Requirements

Floor/Litter	Day Old –	18 weeks	8 – 10 birds/m^2
		19 – 72 weeks	6 – 8 birds/m^2
100 % Slat Floor		19 – 72 weeks	8 – 10 birds/m^2

Feeder Space

Trough-type	Day Old –	18 weeks	10 cm/bird
		19 – 72 weeks	10 cm/$bird^2$
Pan-type	Day Old –	18 weeks	30 – 35 birds/pan
		19 – 72 weeks	25 – 30 birds/pan

Water Space

First 7 days	4 liter water jug/100 chicks in addition to automatic water system
Week 2 – 72 weeks	2.5 cm trough space/bird **or** 1 cup/25 – 35 birds **or** 1 large round automatic waterer for every 150 birds **or** 1 nipple drinker/4 – 6 birds

Figure B: "Brown Nick" Parent Stock Performance Specifications

Liveability	Growing Cycle (0 – 20 weeks): 96 – 98 %	Production Cycle (21 – 72 weeks): 88 – 92 %
Production to 72 Weeks	Total Eggs per Hen Housed Hatching Eggs per Hen Housed Age at 50 % Production Saleable Pullets per Hen Housed	298–303 (300.0) 271–276 (273.8) 145–155 days 109–114 (111.5)
Hatchability	Total hatch, peak Total Hatch, average Hatch of Saleable Pullets, peak Hatch of Saleable Pullets, average	96 % 89 % 43 % 39 %
Sex Determination	Color sex progeny (please refer to color sexing guide on page 43 of this guide)	
Female Body Weight	20 Weeks 40 Weeks 72 Weeks	1500–1700 grams 1800–2000 grams 1900–2100 grams
Male Body Weight	20 Weeks 40 Weeks 72 Weeks	2230 grams 2870 grams 3100 grams
Feed Consumption Including Males	Growing Cycle (0–20 Weeks) Production Cycle (21–72 Weeks)	7.6 kg 40.5 kg

Housing Requirements

Floor Space Requirements

Floor/Litter	Day Old –	18 weeks	8 – 10 birds/m^2
		19 – 72 weeks	6 – 7 birds/m^2
100 % Slat Floor		19 – 72 weeks	7 – 8 birds/m^2

Feeder Space

Trough-type	Day Old –	18 weeks	5 – 10 cm/bird
		19 – 72 weeks	10 cm/$bird^2$
Pan-type	Day Old –	18 weeks	30 – 35 birds/pan
		19 – 72 weeks	25 – 30 birds/pan

Water Space

First 7 days	4 liter water jug/100 chicks in addition to automatic water system
Week 2 – 72 weeks	2.5 cm trough space/bird **or** 1 cup/25 – 35 birds **or** 1 large round automatic waterer for every 150 birds **or** 1 nipple drinker/4 – 6 birds

BROODING AND REARING PROGRAM

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. It also permits uniform programs for light control and vaccination. Traffic between the brood/grow area and laying houses should be avoided. Brooder houses must be kept free of wild birds and rodents because they can be a major source of pathogens and parasites.

Humidity

Humidity is an important aspect of successful brooding. The relative humidity (determined with a wet bulb thermometer), should be maintained on an optimal level, i.e. between 60 and 70 %. Humidity is usually not a problem after 6 weeks of age because it is easier to maintain a satisfactory moisture level at lower temperatures. Besides, the older, larger birds also exhale a considerable amount of moisture into the atmosphere.

Getting Chicks Off to a Good Start

Before the Chicks Arrive:

- For the first two days, the temperature at chick level should be maintained at 35 – 36 °C.
- Chicks which have been shipped long distances by air should be given water with added vitamins and electrolytes.
- Have automatic feed and water systems checked for proper settings and uniform distribution of feed and water.
- Check the settings of the time clocks and dimmers for the lights. Provide 24 hours of light during the first two days or run an intermittent lighting program.
- Coordinate the arrival time of the chicks with the hatchery and confirm the number and condition of the chicks being delivered.
- If a coccidiostat is to be used, be sure it is in the feed.
- Raise males and females together from one day of age.

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 before the chicks arrive.

Temperature Requirements

Age	Temperature °C	Age	Temperature °C
Day 1 – 2*	35 – 36	Week 3	26 – 27
Day 3 – 4	33 – 34	Week 4	22 – 24
Day 5 – 7	31 – 32	from Week 5	18 – 20
Week 2	28–29		

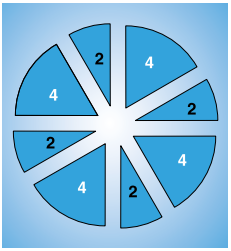
* Body temperatures of 40 – 41 °C are the optimum for chicks

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 proven procedure in splitting the day into phases of resting and activity using a special designed intermittent lighting program. The target of such a program is to synchronize the activity of chicks in order to make it easier for the staff to assess the condition of the flock more accurately and to stimulate feed and water intake through group behavior.
Therefore, H&N International advises to give chicks a brief period of rest after the arrival at the rearing farm and then start the intermittent lighting program of 4 hours light followed by 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 or 10 days after arrival. Then switch to the regular step down lighting program.

The benefits of using such a program are:

- Chicks rest or sleep at the same time. Chicks' behavior is synchronized.
- Weaker chicks are stimulated by stronger ones to be active and to eat and drink.
- Flock behavior is more uniform, which makes the chick assessment easier.
- Mortality in the first week is reduced.

Feed and Water

Additional feed trays should be provided within the brooder ring until all chicks start eating from the regular feeding system.

Automatic watering systems vary in their ability to provide adequate water for day old chicks. 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 the same type water system as they will use in the laying house. This will help prevent dehydration at housing 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.

FEED MANAGEMENT AND BODY WEIGHT TARGETS

H&N has always concentrated on maximizing the genetic potential for profitable egg production in the commercial cross without ignoring the importance of competitive parent performance.

The management guide for parent stock is designed to help parent farms and hatcheries to achieve the best possible results applying management practices which have been successful in most situations.

The actual protein and energy levels used in the different diets will vary from area to area because of the ingredients available, the quality of the ingredients and the ambient temperature. The recommended protein, amino acid and energy levels for the rations fed at each age during the growing period are given in Table 1.

All rations need to be fortified with additional vitamins and trace minerals to assure that "H&N Layer Breeder" parent stock will have good skeletal and muscle development and produce high quality hatching eggs. It is important that vitamins and minerals be added in approximately the levels shown in Table 2.

It is essential that the body weights of "H&N Layer Breeder" parent stock be checked weekly. Maintaining the proper body weight during the grow period will help "H&N Layer Breeder" parent stock perform to the maximum of their genetic potential. Proper body weights and feed consumption levels during the growing cycle appear in Table 3. The exact amount of feed to give the growing flock each day will be influenced by the ambient temperature and feed quality.

The uniformity during the entire growing cycle needs to be monitored very closely. At all times during the growing cycle, at least 85 % of the females should weigh within plus or minus 10 % of the average body weight. Uniformity may drop to levels below 80 % around the time when production reaches 50 % and then increase again.

Table 1: Recommended Nutrient Requirements for H&N Parent Stock (during the Growing Cycle)

Nutrient	Diet type*			
	Starter** 0 – 3 weeks	Grower 1 – 10 weeks	Developer 11 – 16 weeks	Pre-lay 17 week–5 % prod.
Metabol. Energy(kcal) (MJ)	2900 12.00	2750 – 2800 11.40	2750 – 2800 11.40	2750 – 2800 11.40
Crude Protein (%)	20.00 – 21.0	18.0 – 19.0	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	0.68	0.85
Dig. Lysine (%)	0.98	0.82	0.55	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	0.17	0.20
Dig. Tryptothan (%)	0.19	0.17	0.14	0.16
Threonine (%)	0.80	0.70	0.55	0.60
Dig. Threonin (%)	0.65	0.57	0.44	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

* rounded to nearest 5 kcal
** 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.
*** without phytase

Table 2: Recommended Vitamin and Mineral Additions for H&N Parent Stock (per Kilo Feed)

Supplements per kg Feed		Starter / Grower	Developer	Pre-lay / Layer 1 + 2
Vitamin A*	IU	10000	10000	10000
Vitamin D_3	IU	2500	2500	3000
Vitamin E	IU	20–30***	20–30***	50–100***
Vitamin K_3	mg	3****	3****	3****
Vitamin B_1	mg	2	2	4
Vitamin B_2	mg	8	6	10
Vitamin B_6	mg	4	4	6
Vitamin B_{12}	mcg	20	20	30
Pantothenic Acid	mg	10	10	20
Nicotinic Acid	mg	30	30	50
Folic Acid	mg	1.0	1.0	2.0
Biotin	mcg	100	100	200
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	40	40	40
Copper**	mg	5	5	10
Iodine	mg	1.0	1.0	1.0
Selenium**	mg	0.3	0.3	0.3

* 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

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.

Table 3: Nick Chick – Parent Stock Females*
Body Weight Development with Standard Lighting Program

Age (week)	Body Weight (g)			Feed Consumption			Water Consumption	
	average	range		kJ**/bird/day	g/bird/day	cummulative	ml/bird/day	cummulative
1	65	62	68	120	10	70	18	123
2	125	119	131	204	17	189	30	331
3	187	178	196	276	23	350	40	613
4	253	240	266	336	28	546	49	956
5	325	309	341	384	32	770	56	1348
6	403	383	423	432	36	1022	63	1789
7	484	460	509	480	40	1302	70	2279
8	563	535	592	528	44	1610	77	2818
9	640	608	672	576	48	1946	84	3406
10	714	678	750	624	52	2310	91	4043
11	785	746	825	672	56	2702	98	4729
12	854	812	897	720	60	3122	105	5464
13	921	875	967	768	64	3570	112	6248
14	985	936	1034	804	67	4039	117	7068
15	1047	994	1099	840	70	4529	123	7926
16	1106	1050	1161	876	73	5040	128	8820
17	1162	1104	1220	924	77	5579	135	9763
18	1216	1155	1277	984	82	6153	144	10768
19	1268	1204	1331	1044	87	6762	152	11834
20	1317	1251	1383	1104	92	7406	161	12961

* Males and females have approximately the same feed consumption.
** Depends upon sexual maturity - 100 – 200 g higher for hens in production.

Variation is possible due to differences in feed composition and environments.

Table 4: Brown Nick – Parent Stock Females*
Body Weight Development with Standard Lighting Program

Age (week)	Body Weight (g)			Feed Consumption			Water Consumption	
	average	range		kJ**/bird/day	g/bird/day	cummulative	ml/bird/day	cummulative
1	65	62	68	120	10	70	18	123
2	126	120	132	204	19	203	30	331
3	188	179	197	276	25	378	40	613
4	255	242	268	336	30	588	49	956
5	330	314	347	384	35	833	56	1348
6	413	393	434	432	40	1113	63	1789
7	505	480	530	480	45	1428	70	2279
8	598	568	628	528	50	1778	77	2818
9	689	655	724	576	54	2156	84	3406
10	779	740	818	624	56	2548	91	4043
11	867	824	911	672	59	2961	98	4729
12	954	906	1001	720	62	3395	105	5464
13	1038	986	1090	768	65	3850	112	6248
14	1121	1065	1177	804	68	4326	117	7068
15	1203	1143	1263	840	71	4823	123	7926
16	1282	1218	1346	876	74	5341	128	8820
17	1360	1292	1428	924	77	5880	135	9763
18	1437	1365	1509	984	80	6440	144	10768
19	1511	1436	1587	1044	83	7021	152	11834
20	1581	1502	1660	1104	86	7623	161	12961

* Males and females have approximately the same feed consumption.
** Depends upon sexual maturity - 100 – 200 g higher for hens in production.

Variation is possible due to differences in feed composition and environments.

Calcium

Beginning at approximately 45 weeks of age, it is beneficial to provide free choice oyster shell or coarse particle size limestone in hanging feeders. This allows the hens to adjust their own calcium intake, and at the same time does not force the cockerels to consume extra calcium. It also appears to be beneficial to hatchability to have at least 50 % of the calcium in the ration sourced from coarse particle size limestone or oyster shell.

Fortified Feeds

It is important to use a breeder vitamin pack which will meet the needs of the "H&N Layer Breeder" parent female. It is important that the vitamins and minerals be added in approximately the levels shown in Table 2 so the "H&N Layer Breeder" parent female will consume adequate amounts for the hatching eggs she produces.

Laying Cycle Feeding Program

Tables 3 and 4 show the suggested feeding program during the laying period. The "H&N Layer Breeder" parent stock rations are all formulated with a well balanced amino acid profile. This is beneficial in preventing performance problems, feather loss and nervousness, especially in high density breeder houses. Note that lower amino acid and phosphorus levels and higher calcium amounts are required as the birds age.

Table 5: Nutrient Requirements for H&N Parent Stock Production Cycle Feed Phase 1 Diets

Nutrient	Daily Feed Consumption				
	95 g	100 g	105 g	110 g	115 g
Metabol. Energy (kcal / kg*) Energy (MJ)	2750–2800 11.4	2750–2800 11.4	2750–2800 11.4	2750–2800 11.4	2750–2800 11.4
Protein (%)	18.95	18.00	17.14	16.36	15.65
Calcium (%)	4.32	4.10	3.90	3.73	3.57
Total Phosphorus (%)**	0.66	0.63	0.60	0.57	0.55
Av. Phosphorus (%)**	0.46	0.44	0.42	0.40	0.38
Sodium (%)	0.19	0.18	0.17	0.16	0.16
Chloride (%)	0.19	0.18	0.17	0.16	0.16
Lysine (%)	0.91	0.87	0.82	0.79	0.75
Dig. Lysine (%)	0.75	0.71	0.68	0.65	0.62
Methionine (%)	0.46	0.44	0.42	0.40	0.38
Dig. Methionine (%)	0.38	0.36	0.34	0.33	0.31
Met. + Cys. (%)	0.84	0.80	0.76	0.72	0.69
Dig. Met. + Cys. (%)	0.69	0.65	0.62	0.59	0.57
Arginine (%)	0.97	0.92	0.87	0.83	0.80
Dig. Arginine (%)	0.79	0.75	0.72	0.68	0.65
Valine (%)	0.78	0.74	0.71	0.68	0.65
Dig. Valine (%)	0.67	0.63	0.60	0.57	0.55
Tryptophane (%)	0.19	0.18	0.17	0.17	0.16
Dig. Tryptophane (%)	0.16	0.15	0.14	0.14	0.13
Threonine (%)	0.64	0.61	0.58	0.55	0.53
Dig. Threonine (%)	0.52	0.50	0.47	0.45	0.43
Isoleucine (%)	0.73	0.69	0.66	0.63	0.60
Dig. Isoleucine (%)	0.60	0.57	0.54	0.52	0.49
Linoleic acid (%)	2.11	2.00	1.90	1.82	1.74

* A nutritionist should be consulted if energy levels above 2980 or below 2755 kcal/kg are to be used.
** without phytase

Table 6: Nutrient Requirements for H&N Parent Stock Production Cycle Feed Phase 2 Diets

Nutrient	Daily Feed Consumption				
	95 g	100 g	105 g	110 g	115 g
Metabol. Energy (kcal / kg*) Energy (MJ)	2750–2800 11.4	2750–2800 11.4	2750–2800 11.4	2750–2800 11.4	2750–2800 11.4
Protein (%)	17.89	17.00	16.19	15.45	14.78
Calcium (%)	4.53	4.30	4.10	3.91	3.74
Total Phosphorus (%)**	0.75	0.54	0.52	0.49	0.47
Av. Phosphorus (%)**	0.40	0.38	0.36	0.35	0.33
Sodium (%)	0.19	0.18	0.17	0.16	0.16
Chloride (%)	0.19	0.18	0.17	0.16	0.16
Lysine (%)	0.90	0.85	0.81	0.78	0.74
Dig. Lysine (%)	0.74	0.70	0.67	0.64	0.61
Methionine (%)	0.46	0.44	0.41	0.40	0.38
Dig. Methionine (%)	0.38	0.36	0.34	0.32	0.31
Met. + Cys. (%)	0.83	0.79	0.75	0.71	0.68
Dig. Met. + Cys. (%)	0.68	0.64	0.61	0.59	0.56
Arginine (%)	0.95	0.90	0.86	0.82	0.79
Dig. Arginine (%)	0.78	0.74	0.71	0.67	0.65
Valine (%)	0.77	0.73	0.70	0.67	0.64
Dig. Valine (%)	0.66	0.62	0.59	0.57	0.54
Tryptophane (%)	0.19	0.18	0.17	0.16	0.16
Dig. Tryptophane (%)	0.15	0.15	0.14	0.13	0.13
Threonine (%)	0.63	0.60	0.57	0.54	0.52
Dig. Threonine (%)	0.52	0.49	0.47	0.45	0.43
Isoleucine (%)	0.72	0.68	0.65	0.62	0.59
Dig. Isoleucine (%)	0.59	0.56	0.53	0.51	0.49
Linoleic acid (%)	1.68	1.60	1.52	1.45	1.39

* A nutritionist should be consulted if energy levels above 2980 or below 2755 kcal/kg are to be used.
** without phytase

Table 7: Nutrient Requirements for H&N Parent Stock Production Cycle Feed Phase 3 Diets

Nutrient	Daily Feed Consumption				
	95 g	100 g	105 g	110 g	115 g
Metabol. Energy (kcal / kg*) Energy (MJ)	2750–2800 11.4	2750–2800 11.4	2750–2800 11.4	2750–2800 11.4	2750–2800 11.4
Protein (%)	16.84	16.00	15.24	14.54	13.91
Calcium (%)	4.74	4.50	4.29	4.09	3.91
Total Phosphorus (%)**	0.53	0.50	0.48	0.45	0.43
Av. Phosphorus (%)**	0.37	0.35	0.33	0.32	0.30
Sodium (%)	0.19	0.18	0.17	0.16	0.16
Chloride (%)	0.19	0.18	0.17	0.16	0.16
Lysine (%)	0.90	0.85	0.81	0.78	0.74
Dig. Lysine (%)	0.74	0.70	0.67	0.64	0.61
Methionine (%)	0.46	0.44	0.41	0.40	0.38
Dig. Methionine (%)	0.38	0.36	0.34	0.32	0.31
Met. + Cys. (%)	0.83	0.79	0.75	0.71	0.68
Dig. Met. + Cys. (%)	0.68	0.64	0.61	0.59	0.56
Arginine (%)	0.95	0.90	0.86	0.82	0.79
Dig. Arginine (%)	0.78	0.74	0.71	0.67	0.65
Valine (%)	0.77	0.73	0.70	0.67	0.64
Dig. Valine (%)	0.66	0.62	0.59	0.57	0.54
Tryptophane (%)	0.19	0.18	0.17	0.16	0.16
Dig. Tryptophane (%)	0.15	0.15	0.14	0.13	0.13
Threonine (%)	0.63	0.60	0.57	0.54	0.52
Dig. Threonine (%)	0.52	0.49	0.47	0.45	0.43
Isoleucine (%)	0.72	0.68	0.65	0.62	0.59
Dig. Isoleucine (%)	0.59	0.56	0.53	0.51	0.49
Linoleic acid (%)	1.05	1.00	0.95	0.91	0.87

* A nutritionist should be consulted if energy levels above 2980 or below 2755 kcal/kg are to be used.
** without phytase

HEALTH MANAGEMENT

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. Therefore, specific recommendations for an individual farm cannot be given in this guide. 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, 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 500 gms / 200 liters or 50 gms / 20 liters 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 with 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.

Flock Health Monitoring

Serological data obtained at maturity (18 – 20 weeks) is a good method for evaluating the immune status of a parent flock 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 to submit 20 good serum samples to a labo-

ratory one or two weeks prior to the pullets being placed in the lay house to establish freedom from certain diseases such as Mg or Ms prior to onset of production. This type of program can also be the base for a good flock profiling system. Serological data can give valuable information on the titer levels for a number of disease causing agents.

Working with a poultry laboratory in setting up a profiling system, can help to make better evaluations of vaccination programs and flock conditions.

Coccidiosis Control

Coccidiosis is a protozoal disease affecting the intestinal tract. Normally, the disease occurs during the brooding or growing stages, but may occur later in life if good immunity is not established. Outbreaks vary in degree of severity from mild with no clinical signs, to severe with high mortality. Various treatment and control programs are available to the producer.

The best programs are designed to establish natural immunity by means of controlled exposure – vaccination and appropriate litter management.

The general guidelines for use of coccidiostats are:

- Include coccidiostats at appropriate preventative levels in starter feed.
- Decrease coccidiostat by 25 % at about six weeks of age.
- Continue to decrease the coccidiostat until it is entirely removed from the feed by fourteen weeks of age.

Vaccination is another option to consider in a coccidiosis control program. Control by means of vaccination requires uniform application of the vaccine according to label directions, sound poultry husbandry practices and proper nutrition.

With any coccidiosis control program, litter moisture levels of 30 to 35 % are optimal to maintain coccidia at levels necessary for establishing immunity without causing clinical disease.

Never use coccidiostat in the feed when pullets are already vaccinated against coccidiosis.

Sanitation and Biosecurity at the Breeder Farm

- Locate breeding farms in geographically isolated areas away from all other concentrations of poultry, if possible.
- Only authorized vehicles and personnel should be permitted into the farm.
- The farm design should provide optimal isolation between houses and separation of laying and rearing units.
- Control of wild birds and rodents and their exclusion from the poultry houses is extremely important, especially in regards to salmonella control.
- Disinfectant foot baths should be maintained daily at the entrance to each house.
- Limit traffic within each house. One caretaker per house is ideal. Provide each employee with clean overalls, boots and hair covering.

- Completely wash down and disinfect houses between flocks and allow substantial downtime.
- Gather eggs at least four times per day and disinfect within 30 minutes of each gathering.
- Chlorinate open drinker systems with three (3) ppm chlorine and closed (nipple) drinkers with one (1) ppm chlorine.
- Feed ingredients of animal protein origin should be used in very limited quantities. It is better to use only plant sources of protein for breeder rations, if possible.
- Culture samples of feces from nest belts, nest wires, work tables, floor eggs and feed should be collected at least once a month.

Biosecurity at the Hatchery

- The access into the hatchery must be restricted. All visitors must wear overalls, boots and hair coverings.
- The hatchery design should provide separation of incubation from hatching rooms. A separate wash room will allow for cleanup and sanitation of equipment and hatching trays after each hatch.
- Egg carts and transport equipment must be cleaned and disinfected between deliveries. Carts should again be rolled through a disinfectant bath at the hatchery.

Hatchery Monitoring

- Arrange for routine veterinary inspection and testing of facilities and procedures.
- Perform microbial monitoring of meconium and hatch debris on each hatch day.
- Swab samples from cleanup rooms, work tables, equipment and facilities should be collected at least monthly.

LIGHTING PROGRAMS

The lighting program that "H&N Layer Breeder" parent stock are grown under is an important part of the overall management program.

There are several different lighting programs that will work with "H&N Layer Breeder" parent stock. The program that has been found to give excellent results with the most consistency is the constant day length program. A description of the recommended lighting program by area is given below.

Brooding at Latitude 30° and Up

(Brooding Latitude greater than 30°N or 30°S; Temperate Climates)

Tailoring the lighting scheme to a specific breeder flock depends on the type of housing and the hatching date.

First Two Weeks

The lighting program for all flocks in all types of housing is the same for the first two weeks. During the first two days parent stock should be given 24 hours of light each day or an intermittent lighting program can be applied. The intensity should be 10 lux. On day 3, reduce the duration of the light to 16 hours per day and decrease the intensity to 5 – 7.5 lux.

Brooding and Growing in Closed Housing (Light Tight)

At the beginning of the third week, reduce the daily hours of light to 10 – 12 hours. Retain this duration of light until the breeder flock is moved to the laying house. The intensity of light should be 5 – 7.5 lux.

Brooding and Growing in Open Type Housing

In open houses, the lighting program from 15 days of age until transfer to the laying house, depends on the hatching date. Flocks hatched between February 15 and May 15 need to be given artificial light equal to the natural daylight on June 21. On June 21, the artificial day length needs to be changed to the length of the natural day at the time the flock reaches 18 (Brown Nick) / 19 (White Egg Parent Stock) weeks of age. At 15 days of age, the artificial day length for flocks hatched between May 16 and February 14 needs to be set equal to the natural day length at 18 (Brown Nick) / 19 (White Egg Parent Stock) weeks of age. When determining the natural day length from sunrise and sunset tables, be sure to add 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 accordingly (adding 6 months to any given dates).

Brooding at Latitudes 0° to 30°

(Brooding between 30°N and 30°S; Sub-Tropical and Tropical Climates)

Latitudes within 30° of the equator have nearly equal periods of daylight and darkness throughout the year and may have small seasonal variations in high ambient temperatures. Therefore, designing a light program under such circumstances is usually problematic. Poultry men in such areas need to take the amount of natural daylight and the amount of light needed for maximum production into account. They also need to consider adding light during the coolest part of the night to stimulate feed consumption.

The H&N lighting program recommends for flocks placed in latitudes between 0° and 30° North or South, a combination of both constant and step-down programs, regardless of the type of housing.

First Two Weeks

During the first two days parent stock should be given 24 hours of light each day or an intermittent lighting program should be applied. The intensity should be 10 lux. On day 3, reduce the duration of the light to 16 hours per day and reduce the intensity to 5 – 7.5 lux.

Lighting from 15 Days of Age until Transfer to the Laying House

At 15 days of age, the total day length needs to be adjusted to 14 hours of light. Most of the artificial light should be given during the early morning hours.

Between 10 and 12 weeks of age, the step-down phase of the lighting program needs to be initiated if the natural day length at 18 weeks of age is less than 14 hours. The change in artificial day length is dependent on the natural day length at 18 (Brown Nick)/19 (White Egg Parent Stock) weeks of age. The objective is to reduce the total lighting hours at 10 weeks of age (14 hours) to the natural day length at 18 (Brown Nick)/19 (White Egg Parent Stock) weeks of age in a manner that sexual maturity will be delayed. Remember to add one hour to include twilight at dawn and dusk when determining the length of natural daylight from sunrise and sunset tables. The recommended changes are outlined in the table below and charted in the following diagrams.

Natural Daylength at 19 Weeks of Age (hour)	Incremental Decrease (minimum) (minutes)	Step-Down Starting Age (weeks)	Frequency of Change (days)
11	30	13	7
12	15	11	7
13	15	12	14
14	None		-

Use the same break time throughout the growing period. Such a program provides additional light during the coolest part of the day in order to stimulate feed consumption, while at the same time, providing the greater control on sexual maturity that comes from decreasing day length.

Light Control During Laying Period

Pullets grown under good light control require a sharp increase in light to stimulate rapid reproductive development. When the flock is 18 (Brown Nick) / 19 (White Egg Parent Stock) weeks old, the length of day needs to be increased by one hour. Additional stimulations of 60 minutes per week need to be given to bring the total hours of light up to 16 hours. In open houses, when natural day length is more than 12 hours at 18 (Brown Nick) / 19 (White Egg Parent Stock) weeks of age, give a stimulation of 30 minutes per week until 16 hours of light is reached.

Due to the normal high ambient temperatures in some regions, the lights for the laying period should be set to be switched on at 3:30 a.m. and to go off at 7:30 p.m. This schedule allows for feed consumption in the coolest times of the day even during the hottest season of the year.

Light Intensity

Light intensity is an important aspect of a light 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.

Birds also react very well to the stimulation of the increase in light intensity at 18 (Brown Nick) / 19 (White Egg Parent Stock) weeks of age. A minimum of 10 lux should be maintained in the laying house. When the flock is moved to the laying house, the light intensity should be at least equal to the light intensity in the brooder house.

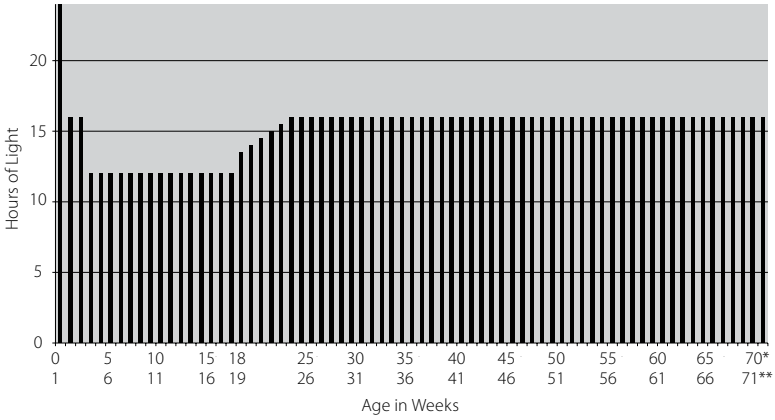
Growing Cycle Records

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.

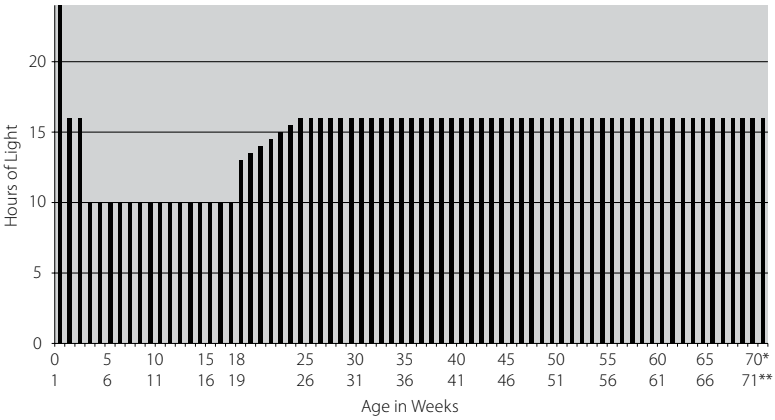
LIGHT PROGRAM GRAPHS

Figure 1: "H&N Layer Breeder" Parent Stock Lighting Program for Light Tight Housing



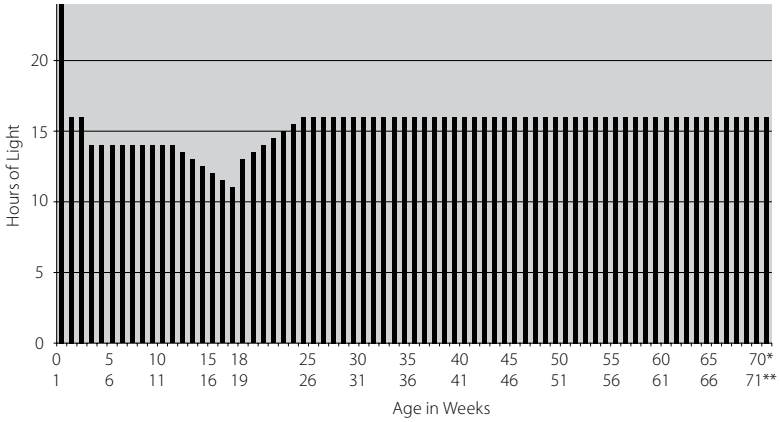
* Brown Nick Parent Stock ** White Egg Parent Stock

Figure 2: "H&N Layer Breeder" Parent Stock Lighting Program for Open Housing 10 Hours of Natural Light at 18 Weeks (Brown Nick) / 19 Weeks (White Egg Parent Stock)



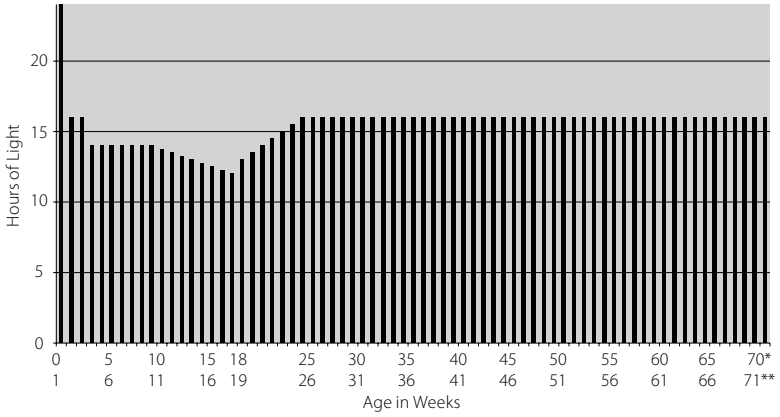
* Brown Nick Parent Stock ** White Egg Parent Stock

Fgiure 3: "H&N Layer Breeder" Parent Stock Lighting Program for Open Housing between 30°N & 30°S, 11 Hours of Natural Light at 18 Weeks (Brown Nick) / 19 Weeks (White Egg Parent Stock)



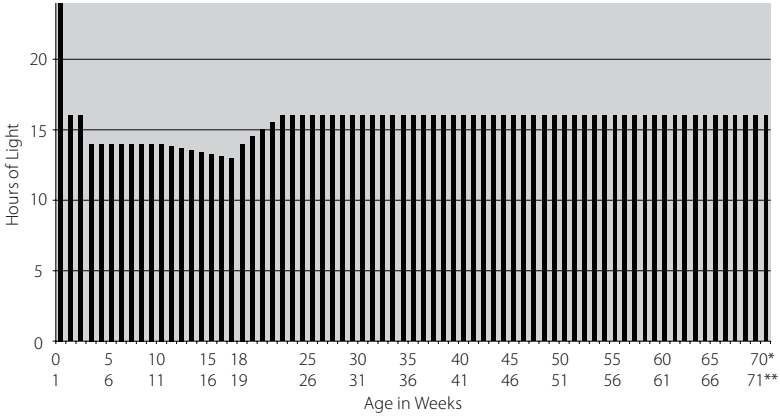
* Brown Nick Parent Stock ** White Egg Parent Stock

Figure 4: "H&N Layer Breeder" Parent Stock Lighting Program for Open Housing between 30°N & 30°S, 12 Hours of Natural Light at 18 Weeks (Brown Nick) / 19 Weeks (White Egg Parent Stock)



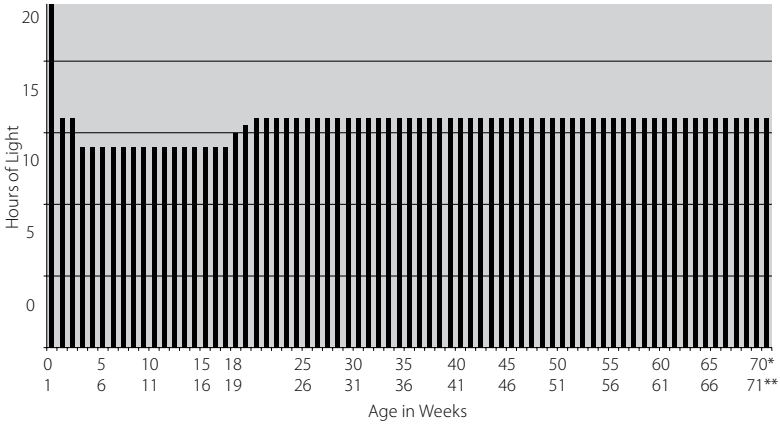
* Brown Nick Parent Stock ** White Egg Parent Stock

Figure 5: "H&N Layer Breeder" Parent Stock Lighting Program for Open Housing between 30°N & 30°S, 13 Hours of Natural Light at 18 Weeks (Brown Nick) / 19 Weeks (White Egg Parent Stock)



* Brown Nick Parent Stock ** White Egg Parent Stock

Figure 6: "H&N Layer Breeder" Parent Stock Lighting Program for Open Housing between 30°N & 30°S, 14 Hours of Natural Light at 18 Weeks (Brown Nick) / 19 Weeks (White Egg Parent Stock)



* Brown Nick Parent Stock ** White Egg Parent Stock

HATCHING EGG MANAGEMENT

Production of Clean Hatching Eggs

Prevention of surface contamination should be the first major step taken towards the control of egg shell borne chick infections. This can be accomplished by the following:

- Provide at least one single nest for every four or five hens or the equivalent area in colony nests. Use of roll away nests is preferred for "H&N Layer Breeder" parents. However, if nests with litter are used, keep the nesting material clean at all times.
- Gather the hatching eggs at least four times daily on clean, sanitized filler or incubator flats.
- Separate floor eggs, dirty eggs, cracked eggs, and all other cull eggs from the good hatching eggs.
- Keep the floor litter in good condition at all times. Dirty feet contaminate otherwise clean eggs and nesting materials.
- It is suggested to lock the hens out of the nests at night to prevent contamination of nests and nesting materials with fecal matter. Birds should also be prevented from roosting on the tops of nests. Nest tops should be scraped clean of any accumulated droppings daily.
- Keep the dust level in the house as low as possible. High dust levels result in high bacterial counts on the egg shell surface.
- Fumigate (if this practice is allowed in your area) or sanitize the hatching eggs. Specific directions for fumigating hatching eggs are available upon request.
- Place conventional nests at a height that is comfortable for the worker and yet low enough so that the hens will use all levels.
- Place feeders (especially pan types) just above the back levels of the smallest birds in the flock yet high enough to prevent laying eggs under them.
- Eliminate dark spots and shadows in the house. This will help prevent floor eggs.
- Prevent cracked eggs. Most cracks are management caused, either through inexperience, inadequate nest material, improperly adjusted equipment, not gathering often enough, gathering too fast, handling the eggs too often or carelessness.

Production Cycle Records

In order to evaluate performance and profitability, detailed production cycle records are necessary. Daily figures for hen-day production, percent hatching eggs, feed and water consumption and mortality are necessary. Male and female mortality should be recorded separately and the male : female ratio

should be monitored throughout the production cycle. As with growing records, accurate cage and/or pen counts are very important.
All results should be graphed. Use of graphs will improve analyses of flock performance trends.

Hatching Egg Storage

Store eggs at 22 °C (72 °F) if setting within 4 days, or 16 – 18 °C (61 – 64 °F) if storing for 5 – 12 days. Older eggs will have markedly lower hatchability. Relative humidity in the holding room should be monitored daily and kept within a range of 70 – 80 %.
Gathering eggs directly onto plastic incubator flats is recommended whenever possible to reduce egg handling and breakage. This assures sanitation of the plastic flats as well. Plastic flats should be washed and disinfected before being returned to the breeder farm.
When hatching eggs are shipped in cases, special precautions must be taken to maintain egg quality. The time period between egg gathering and casing is extremely important for the potential hatchability of the eggs. Hatching eggs must be cooled down overnight and then they may be cased for shipment.
Eggs that are cased on the day of gathering will not lose heat readily, even if the cases are stored in 18°C egg rooms. Substantial increases in early embryonic mortality and a reduction in hatchability will occur from eggs cased before being adequately cooled.
If hatching eggs have to be stored longer than ten days for large orders, we recommend storing the eggs upside down from day one to the time of setting or pre-heating.

Factors Affecting Fertility

Mating Ratio: Start with 10 males per 100 females as day old chicks and mate with 8 – 9 males per 100 females at transferring time to the laying house.
Unthrifty males and other cull birds: By the transfer time to the laying house, cull any defective or unthrifty males and continue to cull any males that get into poor condition as the flock ages. In fact, when selection is made at housing (about 16 – 18 weeks of age), all culls of both sexes should be removed at that time. This would include sick, injured, runty and deformed birds. It is especially important to remove all sexing errors at this time. Sexing errors that are allowed to remain in the flock will impair the genetic potential of resulting commercial stock. Feather and color sexing accuracy of commercial chicks will be adversely affected as well.
High ambient temperature: Mating frequency and fertility decrease as temperatures rise above 29°C, so every effort should be made to maintain house temperatures in a comfortable range. Maximum air movement during hot weather improves bird comfort.
High ambient temperatures also reduce feed consumption. Underconsumption of vital nutrients can also affect fertility. **Keep drinking water cool under high ambient temperatures.**

Insufficient water supply: Water consumption rises dramatically with increasing ambient temperatures as illustrated in the table below. If insufficient watering space is available, or if the watering system or supply is insufficient to meet maximum demand, fertility and production can be drastically reduced.

Impact of House Temperature on Water Consumption*

Maximum Daily House Temperature* (°C)	Liters of Water Consumed/ 1000 Birds/Day
5	154.4
10	165.8
15	176.4
20	200.6
25	252.8
30	335.4
35	406.9

* From M. O. North and D. Bell, Commercial Chicken Production Manual, 4th Edition, 1990, p. 333.

High bird density. Overstocking of facilities may result in increased social pressure and reduced fertility.

Mite and lice infestations. Severe infestations of parasites will reduce mating activity and therefore fertility.

Litter and floor problems. Wet litter and splinters on slats may result in sore feet and reduced mating activity.

Disease problems. Diseases may affect males and females in a flock, resulting in fertility loss due to reduced mating activity as well as increased early embryonic mortality and/or loss of hatchability due to poor shell quality and/or internal egg quality.

HATCHERY TIPS

Incubation Times

Length of incubation for eggs produced by "Brown Nick" parent stock and stored from one to five days require the following incubation periods:

Age of the Breeder Flock at Lay (Weeks)	Length of Incubation for 1 to 5 day-old Hatching Eggs*
< 30	21 days plus 6 hours
30 – 50	21 days plus 3 hours
> 50	21 days plus 6 hours

Length of incubation for eggs produced by "White Egg" parent stock and stored from one to five days require the following incubation periods:

Age of the Breeder Flock at Lay (Weeks)	Length of Incubation for 1 to 5 day-old Hatching Eggs*
< 30	21 days plus 12 hours
30 – 50	21 days plus 9 hours
> 50	Add an hour for each 5 weeks over 40 weeks of age (Example: 21 days plus 12 hours at 65 weeks of age)

* Season, hatchery location, type of equipment and incubation temperature affect the hatching time so the individual hatcheryman will have to adjust the above times to fit his own conditions.

If the hatching eggs are to be held for more than five days, add 1 hour incubation time per storage day exceeding five days.

Evaluating Chick Quality at Hatch

Quality in a product has been defined as the inherent properties which determine the product's degree of excellence. A day old chick is considered to be of good quality if it is able, given good management, to grow quickly and achieve its maximum genetic potential.

Fortunately for the hatchery manager, there are several characteristics which separate prime quality chicks from second quality chicks. The chick should have a body well developed in both length and in the abdomen. The abdomen should appear filled or plump. The down must shine and stand out well in all directions. The down should not be sticky to the touch. The chicks must have good color according to their breed. The legs must appear relatively stout, and have straight extended toes. The chick must also show an erect stance with clear eyes and act lively when not asleep. The navel must be well closed, dry and smooth, with a slight indentation. Chicks which do not meet these standards are less than prime quality, and are subject to higher mortality. The relationship between chick abnormalities and breeder flock and/or incubation problems appears in the following table.

Analyzing Poor Chick Quality

Abnormality	Probable Cause
Abnormal stance, crippled toes, bloody navel knob or navel.	Temperature too high.
Small, short, fat, flabby, pale down, short down, down dry-sticky with pieces of shell.	Temperature too high; low humidity; turned infrequently; eggs transferred too late; eggs stored too long; shells are thin and porous.
Large, soft, abdomen too full, wet-sticky covered with albumen, navels not completely closed.	Humidity too high; temperature too low; poor ventilation; old eggs.
Chicks appear dehydrated, scales on shanks and toes are pronounced and dark in color.	Humidity too low; eggs set too early; chicks remained in hatcher too long.
Clubbed down.	Riboflavin deficient-breeder ration.

Examining the chicks after hatch can indicate whether anything went wrong during incubation and how well they will perform in the future. Chicks which appear weak or show serious abnormalities should be culled. Culling improves the average quality of the layer chicks that will be shipped to your customers, and decreases disease susceptibility. *(Copied from University of Georgia Poultry Tips.)*

Observation	Possible Cause
Clear Eggs.	Infertile. Very early mortality.
Bloodring (embryonic death 2 – 4 days).	Diseased breeding flock; incubating temperature too high; incubating temperature too low; old eggs. Fumigation between 24 to 96 hours of incubation.
Dead embryos 2nd week of incubation.	Temperature too high; temperature too low; eggs not turned; inadequate breeder ration. Too much CO_2 in air (not enough ventilation). Eggs not cooled prior to incubation.
Hatch late.	Temperature too low, 1 – 19 days; humidity too low, 1 – 19 days; incorrect thermometer; large eggs; old eggs. Temperature too low in hatcher; variable room temperature.
Hatch early.	Temperature too high, 1 – 19 days; incorrect thermometer; small eggs; humidity too high, 1 – 19 days.
Air cell too small.	Humidity too high, 1 – 19 days; inadequate breeder ration; large eggs.
Air cell too large.	Humidity too low, 1 – 19 days; small eggs.
Fully developed embryo dead with beak not in air cell.	Temperature too high, 19th day; humidity too high, 19th day; inadequate breeder ration.

Observation	Possible Cause
Fully developed embryo dead with beak not in air cell.	Temperature too high, 20 – 21 days; humidity too high, 20 – 21 days; inadequate breeder ration; incubator air circulation poor.
Chicks pipping early.	Temperature too high, 1 – 19 days.
Chicks dead after pipping shell.	Temperature too high, 20 – 21 days; inadequate breeder ration; inadequate air circulation; 20 – 21 days; incorrect temperature, 1 – 19 days. Temperature too low immediately after egg transfer is made to hatcher. CO_2 content of air is too high, 20 – 21 days. Thin-shelled eggs; disease in breeding flock.
Trays not uniform in hatch or chick quality.	Inadequate incubator air circulation. Eggs of different sizes. Eggs of different breeds. Eggs of different age when set. Disease or stress in some breeder flock.
Sticky chicks (shell, down sticking to chicks).	Humidity too low, 20 – 21 days; temperature too high, 20 – 21 days. Down collections not adequate; eggs transferred too late.
Sticky chicks (albumen sticking to chick down).	Temperature too low, 20 – 21 days; inadequate air in hatcher. Air speed too slow, 20 – 21 days; humidity too high, 20 – 21 days; old eggs.
Chicks too large.	Large eggs. Humidity too high, 1 – 19 days.

Observation	Possible Cause
Chicks too small.	Small eggs. Humidity too low, 1 – 19 days. Thin, porous shells; eggs produced in hot weather.
Crippled chicks.	Variation in temperature, 1 – 21 days.
Mushy chicks.	Unsanitary incubator conditions.
Unhealed navel, dry.	Humidity too high, 20 – 21 days; temperature too low, 20 – 21 days. Inadequate breeder ration; humidity not lowered after hatching completed.
Chicks cannot stand.	Improper temperature, 1 – 21 days; humidity too high, 1 – 19 days; breeder ration inadequate.
Unhealed navel, wet and odorous (mushy chicks) Soft chicks (abdomen).	Omphalitis. Unsanitary hatchery and incubators. Humidity too high, 1 – 19 days; temperature too low, 1 – 19 days.
Closed eyes.	Loose down in hatcher. Down collectors not adequate. Temperature too high, 20 – 21 days; humidity too low, 20 – 21 days.
Chicks dehydrated.	Humidity too low, 20 – 21 days. Eggs set too early. Chicks left in hatcher too long after hatch complete.
Malpositions.	Continuous light in incubators. Inadequate breeder ration. Old breeders, eggs set small end up.

Hatchery Records

Accurate hatchery records are essential in order to evaluate overall performance and for use in analysis of hatchability and chick quality problems. The following information should be monitored continuously and recorded regularly.

1. Egg storage conditions.
2. Setter and hatcher conditions including any problems such as high temperature alarms or turning failures.
3. Total hatchability percentage.
4. Percent hatch of saleable pullets.
5. Percent fertility as determined by candling and breakout of eggs incubated 7 to 10 days.
6. Percent hatch of fertile eggs.
7. Early embryonic death (EED) loss as determined by candling and breakout of eggs incubated 7 to 10 days.
8. Middle and late incubation death loss as determined by breakout and analysis of unhatched eggs on hatch day.

Table 8: Production Goals "White Egg" Parent Stock

Age	Rate of Lay		Egg Number		Hatching Eggs			Hatch %		Number saleable Chicks	
Weeks	HH %	HD %	per Week	cumula-tive	%	per Week	cumula-tive	total Chicks	saleable Chicks	per Week	cumula-tive
21	30.0	30.0	2.1	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	56.0	56.0	3.9	6.0	30.0	1.2	1.2	65.6	32.0	0.4	0.4
23	73.1	73.2	5.1	11.1	60.0	3.1	4.2	73.6	35.9	1.1	1.5
24	83.4	83.6	5.8	17.0	70.0	4.1	8.3	77.7	37.9	1.5	3.0
25	88.9	89.2	6.2	23.2	80.0	5.0	13.3	80.6	39.3	2.0	5.0
26	91.6	92.0	6.4	29.6	85.0	5.5	18.8	82.6	40.3	2.2	7.2
27	92.8	93.3	6.5	36.1	90.0	5.8	24.6	84.5	41.2	2.4	9.6
28	93.4	94.0	6.5	42.6	93.0	6.1	30.7	85.9	41.9	2.5	12.1
29	93.6	94.3	6.6	49.2	94.0	6.2	36.8	87.1	42.5	2.6	14.8
30	93.7	94.5	6.6	55.8	95.0	6.2	43.1	87.7	42.8	2.7	17.4
31	93.6	94.5	6.6	62.3	96.0	6.3	49.4	88.4	43.1	2.7	20.1
32	93.6	94.5	6.6	68.9	96.0	6.3	55.7	88.8	43.3	2.7	22.9
33	93.6	94.6	6.6	75.4	96.0	6.3	61.9	89.0	43.4	2.7	25.6
34	93.5	94.6	6.5	82.0	96.0	6.3	68.2	89.2	43.5	2.7	28.3
35	93.2	94.5	6.5	88.5	96.0	6.3	74.5	89.0	43.4	2.7	31.0
36	93.1	94.5	6.5	95.0	96.0	6.3	80.8	89.0	43.4	2.7	33.8
37	92.8	94.4	6.5	101.5	96.0	6.2	87.0	88.8	43.3	2.7	36.5
38	92.6	94.3	6.5	108.0	96.0	6.2	93.2	88.6	43.2	2.7	39.1
39	92.3	94.2	6.5	114.4	96.0	6.2	99.4	88.4	43.1	2.7	41.8
40	92.1	94.1	6.4	120.9	96.0	6.2	105.6	88.2	43.0	2.7	44.5
41	91.8	94.0	6.4	127.3	96.0	6.2	111.8	87.9	42.9	2.6	47.1
42	91.5	93.8	6.4	133.7	96.0	6.1	117.9	87.7	42.8	2.6	49.8
43	91.2	93.6	6.4	140.1	96.0	6.1	124.0	87.5	42.7	2.6	52.4
44	91.0	93.5	6.4	146.5	95.0	6.1	130.1	87.3	42.6	2.6	54.9
45	90.5	93.2	6.3	152.8	95.0	6.0	136.1	86.9	42.4	2.6	57.5
46	90.1	93.0	6.3	159.1	95.0	6.0	142.1	86.7	42.3	2.5	60.0
47	89.6	92.7	6.3	165.4	95.0	6.0	148.1	86.5	42.2	2.5	62.5
48	89.3	92.5	6.3	171.6	95.0	5.9	154.0	86.1	42.0	2.5	65.0
49	88.8	92.2	6.2	177.8	95.0	5.9	159.9	85.7	41.8	2.5	67.5
50	88.3	91.9	6.2	184.0	95.0	5.9	165.8	85.5	41.7	2.4	70.0

Age	Rate of Lay		Egg Number		Hatching Eggs			Hatch %		Number saleable Chicks	
Weeks	HH %	HD %	per Week	cumula-tive	%	per Week	cumula-tive	total Chicks	saleable Chicks	per Week	cumula-tive
51	87.7	91.5	6.1	190.2	95.0	5.8	171.6	85.1	41.5	2.4	72.4
52	87.3	91.2	6.1	196.3	94.0	5.7	177.4	84.7	41.3	2.4	74.8
53	86.7	90.8	6.1	202.3	94.0	5.7	183.1	84.3	41.1	2.3	77.1
54	86.2	90.4	6.0	208.4	94.0	5.7	188.7	83.8	40.9	2.3	79.4
55	85.6	90.0	6.0	214.4	94.0	5.6	194.4	83.4	40.7	2.3	81.7
56	85.0	89.6	6.0	220.3	94.0	5.6	200.0	83.0	40.5	2.3	84.0
57	84.4	89.2	5.9	226.2	94.0	5.6	205.5	82.6	40.3	2.2	86.2
58	83.7	88.7	5.9	232.1	94.0	5.5	211.0	82.0	40.0	2.2	88.4
59	83.0	88.2	5.8	237.9	93.0	5.4	216.4	81.6	39.8	2.2	90.6
60	82.4	87.7	5.8	243.7	93.0	5.4	221.8	81.0	39.5	2.1	92.7
61	81.6	87.2	5.7	249.4	93.0	5.3	227.1	80.6	39.3	2.1	94.8
62	80.9	86.6	5.7	255.0	93.0	5.3	232.4	80.0	39.0	2.1	96.8
63	80.2	86.1	5.6	260.7	93.0	5.2	237.6	79.5	38.8	2.0	98.9
64	79.4	85.5	5.6	266.2	92.0	5.1	242.7	78.9	38.5	2.0	100.8
65	78.6	84.9	5.5	271.7	92.0	5.1	247.8	78.3	38.2	1.9	102.8
66	77.9	84.3	5.5	277.2	92.0	5.0	252.8	77.7	37.9	1.9	104.7
67	77.1	83.7	5.4	282.6	92.0	5.0	257.7	77.1	37.6	1.9	106.5
68	76.2	83.0	5.3	287.9	91.0	4.9	262.6	76.5	37.3	1.8	108.3
69	75.3	82.3	5.3	293.2	91.0	4.8	267.4	75.9	37.0	1.8	110.1
70	74.4	81.6	5.2	298.4	91.0	4.7	272.1	75.2	36.7	1.7	111.8
71	73.5	80.9	5.1	303.5	90.0	4.6	276.8	74.4	36.3	1.7	113.5
72	72.7	80.2	5.1	308.6	90.0	4.6	281.3	73.8	36.0	1.6	115.2

Table 9: Production Goals "Brown Nick" Parent Stock

Age	Rate of Lay		Egg Number		Hatching Eggs			Hatch %		Number saleable Chicks	
Weeks	HH %	HD %	per Week	cumula-tive	%	per Week	cumula-tive	total Chicks	saleable Chicks	per Week	cumula-tive
21	20.0	20.0	1.4	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	49.0	49.0	3.4	4.8	50.0	1.7	1.7	51.3	25.0	0.4	0.4
23	69.3	69.4	4.9	9.7	60.0	2.9	4.6	69.3	33.8	1.0	1.4
24	81.4	81.6	5.7	15.4	70.0	4.0	8.6	76.5	37.3	1.5	2.9
25	87.7	88.1	6.1	21.5	80.0	4.9	13.5	80.2	39.1	1.9	4.8
26	90.8	91.3	6.4	27.9	85.0	5.4	18.9	82.4	40.2	2.2	7.0
27	92.1	92.7	6.4	34.3	90.0	5.8	24.7	83.8	40.9	2.4	9.4
28	92.5	93.3	6.5	40.8	93.0	6.0	30.8	85.1	41.5	2.5	11.9
29	92.7	93.6	6.5	47.3	94.0	6.1	36.9	85.9	41.9	2.6	14.4
30	92.6	93.7	6.5	53.8	95.0	6.2	43.0	86.7	42.3	2.6	17.0
31	92.6	93.8	6.5	60.2	95.0	6.2	49.2	87.3	42.6	2.6	19.6
32	92.4	93.8	6.5	66.7	95.0	6.1	55.3	87.7	42.8	2.6	22.3
33	92.3	93.8	6.5	73.2	95.0	6.1	61.5	87.9	42.9	2.6	24.9
34	92.1	93.8	6.4	79.6	95.0	6.1	67.6	88.2	43.0	2.6	27.5
35	91.9	93.7	6.4	86.1	96.0	6.2	73.8	88.2	43.0	2.7	30.2
36	91.7	93.7	6.4	92.5	96.0	6.2	79.9	88.2	43.0	2.6	32.9
37	91.5	93.6	6.4	98.9	96.0	6.1	86.1	88.2	43.0	2.6	35.5
38	91.2	93.4	6.4	105.3	96.0	6.1	92.2	88.2	43.0	2.6	38.1
39	90.9	93.3	6.4	111.6	96.0	6.1	98.3	87.9	42.9	2.6	40.8
40	90.6	93.2	6.3	118.0	96.0	6.1	104.4	87.9	42.9	2.6	43.4
41	90.2	93.0	6.3	124.3	95.0	6.0	110.4	87.7	42.8	2.6	45.9
42	89.8	92.8	6.3	130.6	95.0	6.0	116.4	87.5	42.7	2.5	48.5
43	89.5	92.6	6.3	136.8	95.0	6.0	122.3	87.3	42.6	2.5	51.0
44	89.0	92.3	6.2	143.1	95.0	5.9	128.2	87.3	42.6	2.5	53.5
45	88.6	92.1	6.2	149.3	95.0	5.9	134.1	86.9	42.4	2.5	56.0
46	88.1	91.8	6.2	155.4	95.0	5.9	140.0	86.7	42.3	2.5	58.5
47	87.7	91.5	6.1	161.6	95.0	5.8	145.8	86.5	42.2	2.5	61.0
48	87.2	91.2	6.1	167.7	95.0	5.8	151.6	86.3	42.1	2.4	63.4
49	86.6	90.8	6.1	173.7	95.0	5.8	157.4	85.9	41.9	2.4	65.8
50	86.1	90.4	6.0	179.8	95.0	5.7	163.1	85.7	41.8	2.4	68.2

Age	Rate of Lay		Egg Number		Hatching Eggs			Hatch %		Number saleable Chicks	
Weeks	HH %	HD %	per Week	cumula-tive	%	per Week	cumula-tive	total Chicks	saleable Chicks	per Week	cumula-tive
51	85.5	90.0	6.0	185.8	94.0	5.6	168.7	85.3	41.6	2.3	70.6
52	84.9	89.6	5.9	191.7	94.0	5.6	174.3	84.9	41.4	2.3	72.9
53	84.4	89.2	5.9	197.6	94.0	5.6	179.9	84.5	41.2	2.3	75.2
54	83.7	88.7	5.9	203.5	94.0	5.5	185.4	84.1	41.0	2.3	77.4
55	83.2	88.3	5.8	209.3	94.0	5.5	190.8	83.6	40.8	2.2	79.7
56	82.5	87.8	5.8	215.1	94.0	5.4	196.3	83.2	40.6	2.2	81.9
57	81.9	87.3	5.7	220.8	94.0	5.4	201.7	82.6	40.3	2.2	84.0
58	81.1	86.7	5.7	226.5	93.0	5.3	206.9	82.2	40.1	2.1	86.1
59	80.4	86.2	5.6	232.1	93.0	5.2	212.2	81.6	39.8	2.1	88.2
60	79.6	85.6	5.6	237.7	92.0	5.1	217.3	81.2	39.6	2.0	90.3
61	78.9	85.0	5.5	243.2	92.0	5.1	222.4	80.6	39.3	2.0	92.3
62	78.0	84.3	5.5	248.7	92.0	5.0	227.4	80.0	39.0	2.0	94.2
63	77.3	83.7	5.4	254.1	92.0	5.0	232.4	79.3	38.7	1.9	96.1
64	76.4	83.0	5.3	259.4	92.0	4.9	237.3	78.7	38.4	1.9	98.0
65	75.6	82.3	5.3	264.7	90.0	4.8	242.1	77.9	38.0	1.8	99.8
66	74.7	81.6	5.2	269.9	90.0	4.7	246.8	77.3	37.7	1.8	101.6
67	73.9	80.9	5.2	275.1	90.0	4.7	251.4	76.7	37.4	1.7	103.4
68	72.9	80.1	5.1	280.2	90.0	4.6	256.0	75.9	37.0	1.7	105.1
69	72.1	79.4	5.0	285.3	90.0	4.5	260.6	75.0	36.6	1.7	106.7
70	71.1	78.6	5.0	290.2	90.0	4.5	265.0	74.4	36.3	1.6	108.3
71	70.2	77.7	4.9	295.1	90.0	4.4	269.5	73.6	35.9	1.6	109.9
72	69.2	76.9	4.8	300.0	90.0	4.4	273.8	72.8	35.5	1.5	111.5

FEATHER SEXING GUIDE

Sexing is done by examining the rows of primary and covert feathers on the outspread wing as illustrated. The wing should be viewed from the top and good lighting is required for those performing this task. The length of the primaries as compared to the coverts is more important than the total length of the feathers when determining the sex of the chick.

Provided correct mating, chicks from feather-sex parent stock can easily be sexed by inspection of their wing feathers.

Males

Males are slow feathering. In cockerel chicks, primaries (2nd row of feathers) are shorter than or of the same length as coverts (1st row of feathers).

Females

Females are fast feathering. In the pullet chick, primaries (2nd row of feathers) are always longer than coverts (1st row of feathers).
Primaries are longer than coverts.

How to Hold Chicks

The wing should be examined from the top surface, holding the chick, feet down, with the head toward the operator. Fan the wing between thumb and index finger to ease differentiation of feather rows.

COLOR SEXING GUIDE

To improve accuracy of color sexing, please observe the following points:

- Do not try to sex chicks that have not completely dried. Chicks that have been allowed to dry and fluff out will be easier to color sex.
- Be sure to use plenty of bright light. "Cool white" fluorescent light will be too dim. Use of a 200 watt incandescent bulb is recommended.

Males

Most of the males are pure white.

Occasionally they show a slight faint striping on a light ground color

or 2 distinct light stripes with a brown edging

and sometimes one dark stripe in the middle of the back.

Females

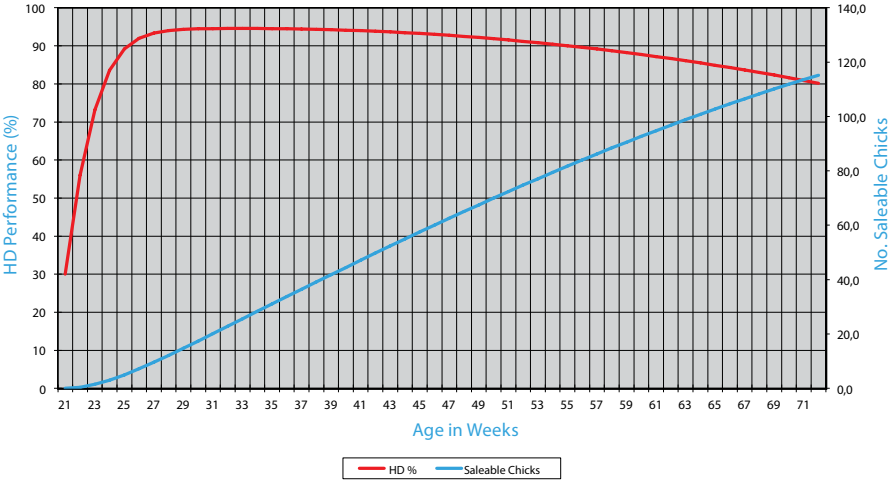
Most of the females are brown with one light stripe in the middle of the back

or are uniformly brown.

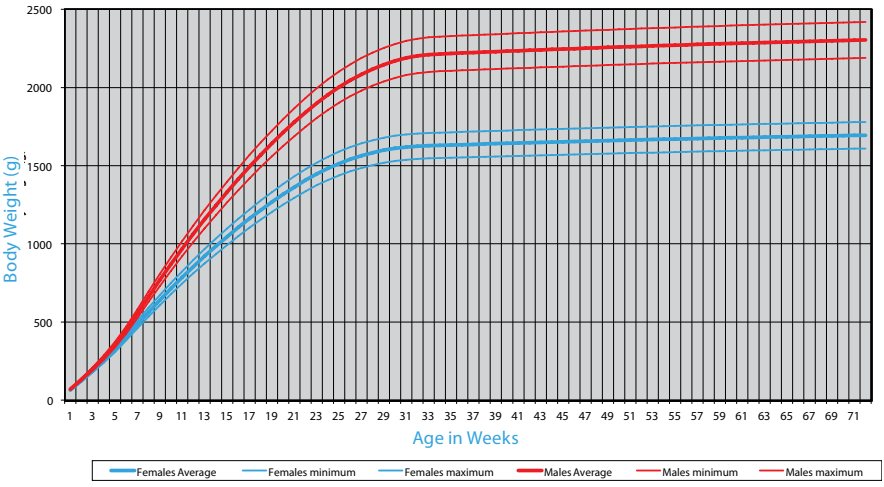
Occasionally they show one broad light stripe with brown edging on a lighter ground color

or seldom have a brown colored head and a generally lighter coloring of the body.

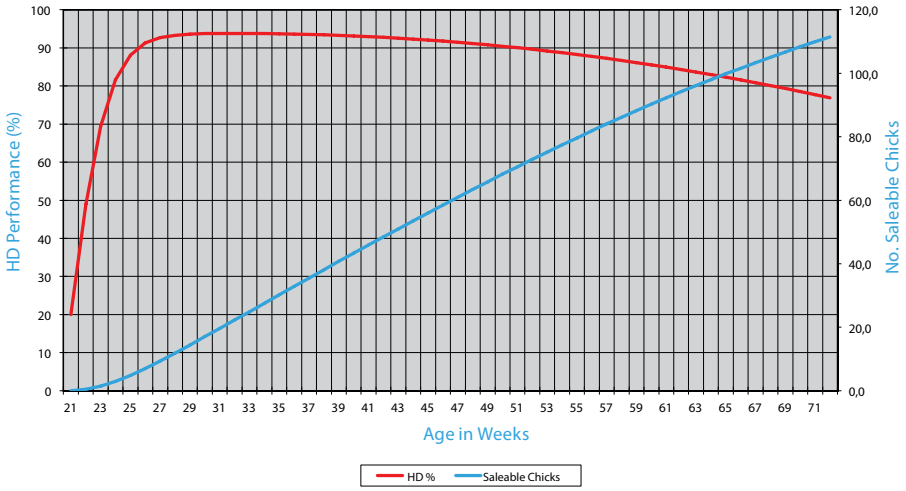
White Egg Parent Stock Performance per Hen Day



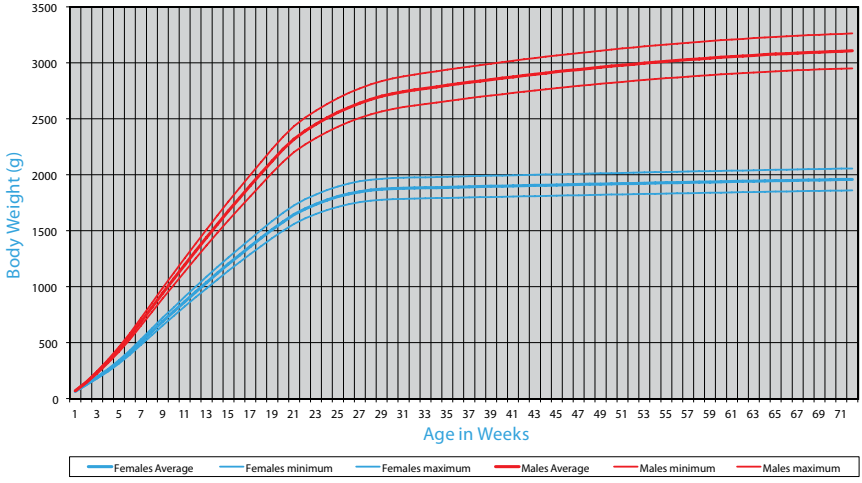
White Egg Parent Stock Body Weights



Brown Nick Parent Stock Performance per Hen Day



Brown Nick Parent Stock Body Weights



NOTES

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

DISCLAIMER

The information, advices and suggestions given in this management guide should be used for guidance and educational purposes only, recognizing that local environmental and disease conditions may vary and a guide cannot cover all possible circumstances. While every attempt has been made to ensure that the information presented is accurate and reliable at the time of publication, H&N International cannot accept responsibility for any errors, omissions or inaccuracies in such information or management suggestions.
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