



**Hubbard**

**H1**

**MANAGEMENT  
GUIDELINES**

**PARENT STOCK**

## FEMALE REARING PERIOD (0 – 24 WEEKS)

### KEY POINTS IN REARING:

- **First week weight ≥ 150 g**
- **100% individual grading between 3 – 4 weeks**
- **Bodyweight ≥ 600 g at 4 weeks**
- **Maintain 50 – 60 minutes eating time; adjust the feeding programme as required**
- **Age at light stimulation should consider both pelvic bone opening and bodyweight**

### ➔ FASTED BODYWEIGHT TARGETS:

Age	Female (g)
7 days	150
4 weeks	600
10 weeks	1 150
16 weeks	1 800
21 weeks	2 470
24 weeks	2 920

▪ **Weighing chicks daily for the first 2 weeks** can help to identify inadequacies in brooder management. Thereafter weigh weekly. Take collective weights the first two weeks and then individual weights thereafter.

▪ **The sample size should not be less than 3 - 5%** from each pen. Take samples from 3 separate places in each pen; weigh every bird in the catching pen to record data which reflects the flock's true bodyweight.

- **Only fasted weight will show the true physiological development of a bird.**

### ➔ MAIN POINTS TO ACHIEVE TARGET BODYWEIGHT WITH GOOD UNIFORMITY:

#### Brooding:

- Use slow step down light: 0-7 days 23 hours, then reduce 1 hour daily to 8 hours or natural light.
- Ensure sufficient light intensity and equipment to promote eating / drinking activity in the first 10 days; use floor paper for feeding to supplement the feed plates for the first 3-5 days, until chicks can easily access the plates.
- If brooder surrounds are used open them up quickly to give full space by 10 days.
- Assure minimum ventilation to encourage bird activity and develop appetite.
- **Feed:**
- **0–28 days:** Full feed for 14 - 21 days. Use pre-starter crumbles for as long as required to achieve the 21 day bodyweight (longer for the smaller chicks). Then change to normal starter crumbles until 28 - 35 days. Assure bodyweight is achieved at 28 days.
- At 28-35 days change to grower feed if bodyweight is on target. As much as possible, use low energy (<2 650 kcal/kg) to improve gut health and eating behaviour.
- Transition feed can normally start at 19 weeks, earlier if struggling with bodyweight gain.
- Flocks transferred from the rearing farm generally lose bodyweight. Anticipate this with extra feed.
- Consistent feed increases from light stimulation to 5% daily production. **Do not hold feed.**
- Change to breeder feed between first eggs and 1% daily production.
- **Feed Programme:**
- Continue daily feed until 28 – 35 days.
- The Hubbard breeder is a fast eater. The choice of feed programme to achieve a consistent eating time of 50-60 minutes is important.
- At 28-35 days change to a 6/7 feeding programme.
- From 36 to 154 days use the 5/7 feed programme to help develop proper eating behaviour and to improve uniformity. If eating time is less than 50 minutes at any time during this period change to 4/7 until 17-18 weeks (150 g max feed per day) and then convert back to 5/7.
- Change to the 6/7 feed programme at 23 weeks and daily feeding at the first eggs (≈ 24 weeks).
- **Grading:**
- By 7 days separate all the small chicks. Manage them to be on target weight by 4 weeks.
- At 21 - 28 days grade the flock 100% and create weight groups, each with above 90% uniformity.
- Improve grade-wise and flock uniformity between 28 and 84 days.
- **At 12 weeks** if flock uniformity is below 85%, re-grade the flock and assure that grade/pen uniformity remains above 90%.
- Before light stimulation re-grade the flock based on pelvic bone opening. Pen those with a smaller bone opening (generally the underweight birds) separately and feed accordingly.

## ➔ EQUIPMENT AND STOCKING DENSITY:

	Moderate climate (21°C)	Hot climate (29°C)
Stocking density	6.0 birds / m <sup>2</sup>	4.5 birds / m <sup>2</sup>
Watering – round	1 / 80 birds	1 / 70 birds
Watering – nipple	1 / 8-10 birds	1 / 6-8 birds
Feeding - chain	15 cm / bird (7.5m/100 birds)	15 cm / bird (7.5m/100 birds)
Feeding pans - round	1 / 12 birds	1/ 12 birds
Feeding pans - oval	1 / 13-14 birds	1 / 12-13 birds
Feed distribution time	4 minutes	4 minutes

## ➔ WATER CONTROL (ONLY IF REQUIRED) / WATER QUALITY:

- On days with feed, stop water 2 - 3 hours after the end of the feed cleanup. If using 4/7 or skip-a-day (SAD) feed programmes, the crop may be too full and no restriction is required.
- On days with no feed give a minimum of 2 hours and longer if it is required.
- Check the crop before stopping the water. It should be soft.
- No water restriction during extremely hot weather or medication treatment.
- Regularly check the chemical and bacteriological water quality to ensure that the water sanitization is functioning properly.

## ➔ GRIT AND GRAIN FROM 4-5 WEEKS:

- Insoluble grit (ø 3-4 mm); 3-5 g / bird / week.
- Scratch grain; 3 g / bird daily (cracked maize or whole wheat).

## ➔ PERCHES:

- Provide 3 cm of perch space/pullet from the 4<sup>th</sup> week to train the pullets to jump up to the nests and to help prevent floor eggs.

## LIGHTING PROGRAMME

### ➔ OBJECTIVE: 5 TO 10% PRODUCTION (WEEK AVERAGE) AT 25 WEEKS:

**Stimulate no earlier** than 147 - 154 days with a uniform minimum **fasted** bodyweight of 2 470 g to 2 620 g. The onset of lay should normally start about 3 weeks after the initial stimulation. If sexual maturity is poor (<85% females with a pelvic bone opening of 3 cm) delay the stimulation accordingly.

- It is advisable from 18 weeks of age onwards to check the progress of the pelvic bone aperture at each weighing. This helps to indicate the overall trend of flock sexual maturity.
- The light programme should be calculated to stimulate the flock when it will be responsive:

Age		Bodyweight (fasted) at stimulation	Pelvic bone opening – sexual maturity			
week	days		> 85% 3 cm		< 85% 3 cm	
			Hours	Lux	Hours	Lux
≤21	146		8	3 to 5	8	3 to 5
21	147	2470	12	60 - 80	8	3 to 5
22	154	2620	13	60 - 80	12	60 - 80
23	161		14	60 - 80	13	60 - 80
24	168		15	60 - 80	15	60 - 80
25	175		16	60 - 80	16	60 - 80

- Numerous parameters effect sexual maturity: the type of house, latitude, season, bodyweight history and uniformity.
- Closed dark rearing conditions are the easiest to operate. For open-side housing we advise darkening the houses during rearing. Do this by 5 to 6 weeks of age, using black curtains, light traps on fans and air inlets. Dew / shed net to cover the sides also works, but ventilation and season must be carefully considered to assure proper ventilation.
- The light programme for males is often the same as for females. This programme can however be adjusted according to the males' level of maturity at the end of the rearing period to help assure a good balance of the male and female sexual maturity.

## ➔ LIGHT INTENSITY:

- Uniform light intensity is important. In closed houses decrease gradually to 3-5 lux at 4-5 weeks.
- In non-light-proof houses during periods of increasing day length maintain light intensity at 10 lux.
- During production:
- Light-proof houses: Consider type of light: incandescent, energy saver (white or yellow), tube, sodium, LED
- Traditional open-sided type houses: The additional artificial light should be given both in the morning and evening period using a light intensity of a minimum of 80 lux in season and 60 lux out of season. Use a photo sensor to maintain uniform light intensity on cloudy days.

## PRODUCTION PERIOD 25 – 65 WEEKS

### KEY POINTS FOR OPTIMUM CHICK PRODUCTION:

- **Flocks with adequate physiological development at the chosen time for light stimulation**
- **Appropriate eating behaviour between first eggs and 5% daily production**
- **Feeding the flock for production and choosing the correct moment for peak feed**
- **Observance of, and reaction to male and female behaviour to minimize stress**
- **Use a proper size restriction grill 45mm X 60mm to control male access**
- **Timely reaction to floor laying with corrective action**

	Moderate climate (21°C)	Hot climate (29°C)
density Stocking	5.0 to 5.5 birds / m <sup>2</sup>	4.0 birds / m <sup>2</sup>

(Refer to the "Conventional" Breeder Guide for equipment standards in production)

## ➔ BODYWEIGHT DURING PRODUCTION:

Once feeding for production has started, non-fasted bodyweight may rise to the top or sometimes higher than our bodyweight range. It is not advised to hold feed because non-fasted bodyweight appears higher than the target if production is increasing within the stated limits shown below. Peak could be affected.

## ➔ FEEDING DURING PRODUCTION:

- From the first eggs to peak production:
- Eating behaviour, stocking density, eating / drinking space and ventilation are critical for a good peak and persistency. **Maintain the supplementary feed hoppers until the end of the flock.**
- Change to daily feeding and breeder feed between first eggs and 1% daily production; if changed too early, flock uniformity can be lost due to change in eating behaviour. If house temperature is above 25°C increase both protein and energy, by using the onset of lay formulation.
- Assure that the protein and energy ratio is **53.5 g/kg per 1 000 kcal**. Too much protein causes bodyweight to increase and often the flock is underfed (trying to control bodyweight) and peak production is compromised.
- Increase feed according to the production level:
- Once 5% daily production is achieved the flock is ready to feed for production.
- Feed the flock according to the daily increase in production; flocks will vary, some with increases of more than 4% daily and others with 3% daily increase. Sexually uniform flocks can achieve 80% production in 15 - 18 days.
- As production increases assure that:
  - Bodyweight gain is consistent between 25 and 30 weeks and does not stall
  - Egg weight increases by 0.8-1 g/week
  - Production increases 3-5% / day in a normal sexually mature flock
  - Egg mass increases 0.34 – 0.57 g per day.

- Female parent stock target daily nutrient allocation at peak:
- The general objective is to reach the maximum feed intake by no later than 60% daily production. The use of the daily onset of lay sheet is advised and allows fine tuning for each individual flock.
- The flock requires 25 g of crude protein and 460–480 kcals energy per day to support a normal peak, but in the case of a flock producing over the standard, some additional feed may be required to support the extra production.

## Amino-acids (mg/bird/day)

	Tot.	Dig.
Lysine	1190	1060
Methionine	580	520
Meth. & Cystine	1020	910
Valine	975	855
Isoleucine	930	810
Arginine (2)	1300	1105
Tryptophan	300	250
Thréonine	860	740

## Ideal Protein

100
49
86
81
76
104
24
70

## Metabolisable energy intake (Kcal or MJ /bird/day)

Temperature	°C	15.0	17.5	20.0	22.5	> 25.0 (1)
	°F	59.0	63.5	68.0	72.5	> 77.0 (1)
Floor	Kcal	500	485	470	460	470 to 480
	MJ	2.09	2.03	1.97	1.92	1.97 to 2.00
Cage	Kcal	475	460	445	435	445 to 460
	MJ	1.99	1.92	1.86	1.82	1.86 to 1.92

## Minerals (mg/bird/day)

	Min.	Max.
Calcium	4800	5300
Av. phosphorus	630	680

## Feed intake (g/bird/day)

Temperature	°C	15.0	17.5	20.0	22.5	> 25.0 (1)	
	°F	59.0	63.5	68.0	72.5	> 77.0 (1)	
ME level	2700	Floor	185	180	174	170	174 to 178
	Kcal/kg	Cage	176	170	165	161	165 to 170
in feed	2800	Floor	179	173	168	164	168 to 171
	Kcal/kg	Cage	170	164	159	155	159 to 164

(1) The additional energy demands to dissipate heat will vary with bodyweight, feed intake, feed composition (oil content), feathering, activity and environmental management.

(2) The arginine / lysine ratio can be increase to 110 % in hot conditions.

**Note: For each 100 g bodyweight above the standard the female requires approximately 10 calories more feed.**

- During hot weather to stimulate production:
  - Change to the "onset of lay" feed formula
  - Increase the particle size of the feed (mash to crumble or crumble to pellet)
  - Turn on the lights in the middle of the dark (sleeping) period for 1 to 2 hours and give cold water with vitamin C and salicylic acid to reduce heat stress.

### ➔ PERSISTENCY:

#### ▪ The objectives are to control:

- Bodyweight - fleshing
- Egg weight increase
- Body fat

Generally one may maintain peak feed until production drops below 80% and then reduce 1 g per 2% decrease in production. However, good control of bodyweight is essential and feed should be immediately adjusted at any time that bodyweight drifts away from the recommended objective.

If production drops after a feed reduction, reinstate the previous amount. Adjust feed for both hot (>25°C) and cold (<18°C) weather to supplement metabolic requirements.

### ➔ FLOOR EGGS:

- Some factors that can influence floor eggs:
- Incorrect number, design, distribution and access to the nests
- Poor water and feed management. Avoid a too long eating time and poor feed distribution. Maintain the correct water pressure / level in the drinkers
- Male aggressiveness and eating behaviour blocks females from entering the nest. In this case remove excess males to a level where the flock is in harmony
- Frequent floor walking to find the floor layers and to place them in a nest
- In manual nests, use of plastic mats and / or too little nest litter is uncomfortable
- Poor light intensity, which causes dark areas and deep litter is attractive to the hens
- Slat height too high - 50 cm is recommended.

## HUBBARD MALE MANAGEMENT

### ➔ REARING PERIOD: 3 STEPS:

#### ▪ Step 1: 1 day to 10 weeks ➔ growth and uniformity:

- Good brooding conditions
- Crumble feed the first 3 weeks
- Good early frame development
- Individual grading at 28 days into tight weight groups with 90% uniformity
- No feed day feeding system starts from 5 weeks (6/7)
- Careful beak trimming at 7 - 10 days. Follow local legislation.

Fasted BW (g)	4w	10w	15w	20w	24w
M99	≥ 660	1 450	2 040	2 720	3 300
M77	700	1 530	2 180	2 930	3 570

#### ▪ Step 2: 10 to 15 weeks ➔ consistent growth:

- Consistent growth on the target bodyweight with good uniformity.

#### ▪ Step 3: 15 to 24 weeks ➔ testicle development:

- Bodyweight must not stall in this period to prevent future fertility issues
- Observe eating behaviour and correct accordingly.

### ➔ EQUIPMENT:

	REARING	PRODUCTION
Density	4 males / m <sup>2</sup>	
Linear troughs Pan feeders	20 cm/male 1/8 males	20 cm/male 1/8 males
Bell drinkers Nipple drinkers (120ml/mn )	1/80 males 1/10 males	
Distribution time	4 minutes	4 minutes

### ➔ PRODUCTION PERIOD:

#### ▪ Mixing to 27 weeks:

This period is crucial to establish a good relationship between the males and females:

- Never mix shy, immature males
- Mix males that are on target bodyweight with uniform skeleton size and good leg length
- Progressive mixing is ideal: 5% at 24 weeks. Observe flock behaviour and gradually increase to a total of 8 – 9% mature males at 26-27 weeks of age. This is usually sufficient when the male bodyweight is under control
- The risk of excessive weight gain and / or loss of condition during this period is high so:
  - Grill size is important to reduce male access to the female feeder
  - Weigh males twice weekly and adjust feed to comply with their bodyweight and condition
  - Feed males when the female feed distribution is complete
  - Special low protein (13-13.5%) male mash feed is recommended.

#### ▪ After 27 weeks:

- Male bodyweight gain should be regular
- Maintain bodyweight within the range shown on the graph. Feed as required.

### ➔ SPIKING:

- Biosecurity must be considered before doing this, especially in areas with Avian Influenza risk.
- Inter-house spiking is best, which does not require importing males from outside. All poor quality males are eliminated and then the whole flock is re-mated.
- Young males should weigh at least 3 700 g and be at least 27 weeks old. They should come from a known clean source. These young males are placed in one house and then the rest of the remaining good ones are re-mated as in inter-house spiking.

## NUTRITION

- **Nutrient recommendations: g/kg per 1 000 kcal (Mcal) of metabolisable energy – floor system :**

PHASE	PRE-STARTER		STARTER		PULLET		TRANSITION		ONSET OF LAY		BREEDER I		BREEDER II		MALE	
Age fed (days)	Optional 0 to 10		0 or 10 to 28 / 35		28 or 35 to 147/168		Optional 147 to 175		Optional 168 to 224		168 or 224 to 280 /cull		Optional 280 to cull		Optional 140 to cull	
Suggested kcal	2.800 - 3.000		2.750 - 2.900		2.400 - 2.900		2.600 - 2.900		2.650 - 2.900		2.650 - 2.900		2.650 - 2.900		2.400 - 2.900	
ME per Kg MJ	11.70 - 12.50		11.50 - 12.10		10.00 - 12.10		10.90 - 12.10		11.10 - 12.10		11.10 - 12.10		11.10 - 12.10		10.00 - 12.10	
Min. amino-acids	Tot.	Dig.	Tot.	Dig.	Tot.	Dig.	Tot.	Dig.	Tot.	Dig.	Tot.	Dig.	Tot.	Dig.	Tot.	Dig.
Lysine	3.80	3.39	3.71	3.32	2.59	2.26	2.62	2.31	2.59	2.31	2.53	2.26	2.48	2.21	2.45	2.14
Methionine	1.60	1.45	1.55	1.40	1.24	1.08	1.25	1.10	1.33	1.20	1.23	1.11	1.20	1.07	1.17	1.02
Meth. & Cystine	2.90	2.58	2.80	2.50	2.16	1.88	2.18	1.92	2.30	2.05	2.17	1.94	2.13	1.90	2.04	1.78
Valine	2.61	2.30	2.55	2.22	2.00	1.70	2.04	1.73	2.12	1.86	2.08	1.82	2.03	1.78	1.89	1.61
Isoleucine	2.55	2.25	2.50	2.21	1.96	1.68	2.00	1.71	2.02	1.76	1.98	1.72	1.94	1.69	1.85	1.59
Arginine	4.00	3.58	3.81	3.42	2.70	2.30	2.70	2.30	2.82	2.40	2.77	2.35	2.71	2.30	2.55	2.17
Tryptophan	0.75	0.64	0.73	0.62	0.61	0.51	0.62	0.52	0.65	0.54	0.64	0.53	0.63	0.52	0.58	0.48
Threonine	2.58	2.25	2.55	2.22	1.85	1.57	1.86	1.58	1.87	1.60	1.83	1.57	1.79	1.54	1.75	1.48
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Crude protein (1)	65.00	69.00	64.00	68.00	53.50	55.50	53.50	55.50	53.50	55.50	53.50	55.50	53.00	55.00	49.00	53.00
Calcium	3.60	3.80	3.60	3.70	3.30	3.50	4.50	5.00	10.00	11.00	10.25	11.25	11.50	12.50	3.30	3.50
Av. Phosphorus	1.60	1.70	1.50	1.60	1.40	1.50	1.40	1.50	1.40	1.50	1.35	1.45	1.25	1.35	1.40	1.50
Sodium	0.60	0.70	0.58	0.70	0.55	0.70	0.55	0.70	0.55	0.70	0.55	0.70	0.60	0.70	0.55	0.75
Chloride	0.60	0.80	0.60	0.80	0.60	0.80	0.60	0.80	0.60	0.80	0.60	0.80	0.60	0.80	0.60	0.80

(1) The progress made in raw material analyses and digestible amino acid evaluation should avoid unnecessary protein excess which can be the cause of excessive muscle deposition, poor litter quality and low hatchability.

**Note:** For birds housed in cages, provide 5 % more amino-acids.

From the above table the nutritionist can make whatever ration he/she is required to do. Following are two examples of diet specifications for floor and cage housed birds:

- **Example of diet specifications for floor housing (> 28°C):**

PHASE	PRE-STARTER		STARTER		PULLET		TRANSITION		ONSET OF LAY		BREEDER I		BREEDER II		MALE	
Age (days)	0 to 10		11 to 35		35 to 147		147 to 5% lay		5% lay to 224		224 to 315		315 to cull		147 to cull	
ME kcal/kg	2 850		2 750		2 650		2 750		2 825		2 800		2 775		2 650	
MJ/kg	11.90		11.50		11.10		11.50		11.80		11.70		11.60		11.10	
Min. amino-acids	Tot.	Dig.	Tot.	Dig.	Tot.	Dig.	Tot.	Dig.	Tot.	Dig.	Tot.	Dig.	Tot.	Dig.	Tot.	Dig.
Lysine %	1.08	0.97	1.02	0.91	0.69	0.60	0.72	0.63	0.73	0.65	0.71	0.63	0.69	0.61	0.65	0.57
Methionine %	0.46	0.41	0.43	0.39	0.33	0.29	0.34	0.30	0.38	0.34	0.35	0.31	0.33	0.30	0.31	0.27
Meth. and Cyst. %	0.83	0.74	0.77	0.69	0.57	0.50	0.60	0.53	0.65	0.58	0.61	0.54	0.59	0.53	0.54	0.47
Valine %	0.74	0.66	0.70	0.61	0.53	0.45	0.56	0.48	0.60	0.52	0.58	0.51	0.56	0.49	0.50	0.43
Isoleucine %	0.73	0.64	0.69	0.61	0.52	0.45	0.55	0.47	0.57	0.50	0.55	0.48	0.54	0.47	0.49	0.42
Arginine %	1.14	1.02	1.05	0.94	0.72	0.61	0.74	0.63	0.80	0.68	0.77	0.66	0.75	0.64	0.68	0.58
Tryptophan %	0.21	0.18	0.20	0.17	0.16	0.14	0.17	0.14	0.18	0.15	0.18	0.15	0.17	0.14	0.15	0.13
Threonine %	0.74	0.64	0.70	0.61	0.49	0.42	0.51	0.43	0.53	0.45	0.51	0.44	0.50	0.43	0.46	0.39
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Crude protein %	18.50	19.00	17.50	18.00	14.50	15.00	15.00	15.50	15.75	16.25	15.50	16.00	15.00	15.50	13.50	14.00
Crude fibre %	2.50	3.50	2.50	3.50	3.50	8.00	3.00	6.00	3.00	6.00	3.00	6.00	3.50	6.50	3.50	6.50
Calcium %	1.00	1.05	1.00	1.05	0.90	0.95	1.25	1.40	2.90	3.10	3.00	3.20	3.20	3.40	0.90	0.95
Av. Phosphorus %	0.46	0.48	0.41	0.44	0.37	0.40	0.39	0.41	0.40	0.42	0.38	0.41	0.35	0.37	0.37	0.40
Sodium %	0.16	0.22	0.16	0.20	0.16	0.20	0.16	0.20	0.16	0.20	0.16	0.20	0.16	0.20	0.16	0.20
Chloride %	0.18	0.25	0.18	0.22	0.16	0.22	0.16	0.22	0.16	0.22	0.16	0.22	0.16	0.22	0.16	0.22
Potassium %	0.70	0.80	0.65	0.75	0.55	0.70	0.55	0.75	0.60	0.75	0.60	0.75	0.55	0.70	0.55	0.70
Crude fat %	3.00	5.00	3.00	5.00	2.50	4.00	3.00	4.00	4.50	5.00	4.00	4.50	3.50	4.00	2.50	4.00
Linoleic acid %	1.20	1.80	1.20	1.80	1.00	1.40	1.20	1.40	1.90	2.10	1.60	1.80	1.30	1.50	1.30	1.50

- **Note:** Increasing vitamin levels by 20 % at the start of production is an additional precaution.

• **Example of diet specifications for cage housing (> 28°C):**

PHASE	PRE-STARTER		STARTER		PULLET		TRANSITION		BREEDER I		BREEDER II		MALE	
Age (days)	0 to 10		11 to 35		35 to 147		147 to 5% lay		224 to 315		315 to cull		147 to cull	
ME kcal/kg	2 850		2 750		2 650		2 750		2 800		2 775		2 650	
MJ/kg	11.90		11.50		11.10		11.50		11.70		11.60		11.10	
Min. amino-acids	Tot.	Dig.	Tot.	Dig.	Tot.	Dig.	Tot.	Dig.	Tot.	Dig.	Tot.	Dig.	Tot.	Dig.
Lysine %	1.08	0.97	1.02	0.91	0.70	0.61	0.76	0.67	0.74	0.66	0.72	0.64	0.68	0.59
Methionine %	0.46	0.41	0.43	0.39	0.34	0.29	0.36	0.32	0.36	0.33	0.35	0.31	0.33	0.28
Meth. and Cyst. %	0.83	0.74	0.77	0.69	0.58	0.51	0.63	0.55	0.64	0.57	0.62	0.55	0.57	0.49
Valine %	0.74	0.66	0.70	0.61	0.54	0.46	0.59	0.50	0.61	0.54	0.59	0.52	0.53	0.45
Isoleucine %	0.73	0.64	0.69	0.61	0.53	0.45	0.58	0.49	0.58	0.51	0.57	0.49	0.52	0.44
Arginine %	1.14	1.02	1.05	0.94	0.73	0.62	0.78	0.66	0.81	0.69	0.79	0.67	0.71	0.60
Tryptophan %	0.21	0.18	0.20	0.17	0.16	0.14	0.18	0.15	0.19	0.16	0.18	0.15	0.16	0.13
Threonine %	0.74	0.64	0.70	0.61	0.50	0.42	0.54	0.45	0.54	0.46	0.52	0.45	0.49	0.41
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Crude protein %	18.50	19.00	17.50	18.00	14.50	15.00	15.00	15.50	15.75	16.25	15.25	15.75	13.50	14.00
Crude fibre %	2.50	3.50	2.50	3.50	3.50	8.00	3.00	6.00	3.00	6.00	3.50	6.50	3.50	6.50
Calcium %	1.00	1.05	1.00	1.05	0.90	0.95	1.25	1.40	3.10	3.30	3.30	3.50	0.90	0.95
Av. Phosphorus %	0.46	0.48	0.41	0.44	0.37	0.40	0.39	0.41	0.39	0.41	0.35	0.37	0.37	0.40
Sodium %	0.16	0.22	0.16	0.20	0.16	0.20	0.16	0.20	0.16	0.20	0.16	0.20	0.16	0.20
Chloride %	0.18	0.25	0.18	0.22	0.16	0.22	0.16	0.22	0.16	0.22	0.16	0.22	0.16	0.22
Potassium %	0.70	0.80	0.65	0.75	0.55	0.70	0.55	0.75	0.60	0.75	0.55	0.70	0.55	0.70
Crude fat %	3.00	5.00	3.00	5.00	2.50	4.00	3.00	4.00	4.00	4.50	3.50	4.00	2.50	4.00
Linoleic acid %	1.20	1.80	1.20	1.80	1.00	1.40	1.20	1.30	1.60	1.80	1.30	1.50	1.30	1.50

**Note:** Increasing vitamin levels by 20 % at the start of production is an additional precaution.

The performance data contained in this document was obtained from results and experience from our own research flocks and flocks of our customers. In no way does the data contained in this document constitute a warranty or guarantee of the same performance under different conditions of nutrition, density or physical or biological environment. In particular (but without limitation of foregoing) we do not grant any warranties regarding the fitness for purpose, performance, use, nature or quality of the flocks, nor any warranty regarding compliance with local legislation regarding health, welfare, or other aspects of animal production. Hubbard makes no representation as to the accuracy or completeness of the information contained in this document.

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