Hubbard

YOUR CHOICE, OUR COMMITMENT

BREEDING FOR YOU SINCE 1921

EFFICIENCY PLUS

BROILER

Guide and Nutrient specifications

INTRODUCTION

The objective of this guide is to provide Hubbard customers with key information on management and nutrition for broilers.
Nutrient recommendations are given in g / kg per 1 000 kcal of metabolisable energy to take into account different nutritional practices, ingredient economics and raw material availability around the world.

TABLE OF CONTENTS

1. KEY POINTS

>> Pre-placement house preparation with efficient control of the feeders, drinkers, heaters, thermostats and sensors, floor temperature and ventilation.
>> Optimum starter period with a 7 - day bodyweight of at least 4.2 times the initial chick weight.
>> Controlling growth rate between 7 - 14 days using a lighting programme suitable for estimated slaughter weight. The aim is to strengthen the skeleton before adding muscle mass.
>> Good ingredient quality, appropriate nutrient balance and optimised feed intake with good feed presentation.

2. STARTING PERIOD

>> The first week of life is key to ensure future performance. The bird's body weight increases 4.2 to 5 times over the first week, and an extra 10 g of bodyweight at 7 days can increase the 40 - day weight by 50 - 60 g.

2.1. QUALITY OF DAY-OLD CHICKS

>> Check the quality of the day-old chicks (a sample of at least 30 chicks) using the table below.
>> Weigh a representative number of chicks at random to get an accurate initial body weight and uniformity, in order to adapt your management according to the results.

Parameters	Characteristics
Eyes	Dry, clean and bright
Navel (Fig. 1)	Sealed and clean
Beak	Clean, free from red spots (Fig. 2) and malformation
Feet	Warm, free from deformed toe, malformation, red and swollen hocks (Fig. 3)
Activity (Fig. 4)	Place a chick on its back, it should turn over within 3 seconds
Down and appearance	Clean and dry

Fig. 1 – Navel not sealed properly

Fig. 2 – Red spot

Fig. 3 – Red hock

Fig. 4 – Activity

>> A good quality chick is mainly perceived by its activity, some chirping, the absence of respiratory anomalies and a properly healed navel.

2.2. ENVIRONMENTAL FACTORS

>> Newly hatched chicks are not capable of fully regulating their body temperature.

- Make sure the house and the floor is nice and warm (Appendix 1 - page 10). The comfort zone for a baby chick is very tight (32 - 33 °C). Below 32 °C, the chick is not capable of maintaining its body temperature. Above 34 °C, the chicks are less active and are at risk of low feed intake.
- Check and record the temperature, humidity, air speed, and observe chick behaviour (Fig. 5): distribution throughout the house, chirping, attitude, feeding and drinking activity.

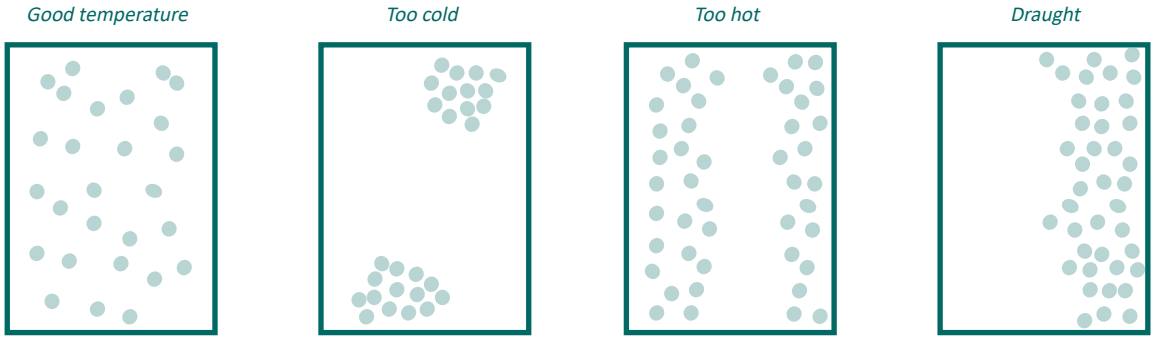

Fig. 5 – Interpretation of the distribution of chicks in their brooding area

- The adjustment of the equipment has to be based on the observations of the chick behaviour.
- Chicks from young breeder hens are smaller and so require a higher temperature, about 1 °C higher during the first week.
- If chicks have cold feet, increase the temperature to 34 - 35 °C for at least 4 - 6 hours. Reassess temperature of the feet regularly until they come back to normal before decreasing the house temperature.
- Vent temperature can be checked with an accurate and regularly calibrated digital thermometer without moving chicks outside the brooding area to ensure no bias in the measure. The target temperature is 39.5 to 40.5 °C.

2.3. FEED AND WATER

>> Early feeding stimulates the development of the chick's gastrointestinal system and promotes resorption of the yolk sac.

- The floor area needs to be covered with feeding points (paper, egg trays, pans and/or troughs) when the chicks arrive, and placed next to a water source so that the chicks can also find clean fresh water straight away (Appendix 2 - page 10).
- 40 to 60 grams of crumb or mini-pellet feed on paper is recommended in 40 to 50 % of the brooding area (Fig. 6). This paper, if not biodegradable, should be removed on the third day after the placement of the chicks.
- During the first 7 - 10 days supplementary feeders or egg trays (1 per 100 chicks) should be provided as they are essential for a successful change to pan or feeders. They can be removed when the chicks are able to use the pan feeders from outside and cannot sleep inside them anymore.
- Renew the feed at regular intervals during the first 3 - 5 days according to chick size.

Fig. 6 – Feed on paper at start

>> Water is very important as broilers will drink 1.6 to 2 times as much as they eat, depending on age and watering system.

- Refilling and cleaning drinkers (bell and nipple) should take place several times a day during the first week and regularly at older ages especially after treatment has been provided through the water.
- Use supplementary drinkers for the first 24 - 72 hours in case of bell or trough drinkers.
- Adjust the height of the drinking lines (nipples) and the water pressure every day.

Fig. 7 – Full, soft and rounded crop

>> Eight hours after placement, at least 80 % of the chicks must have their crop full of feed and water (Fig. 7). This has to increase to 96 % about 24 hours after placement.If not, review feed placement, feed quality and water supply and the brooding conditions (temperature, light intensity, chick quality…).

2.4. LIGHTING

>> Recommended lighting programme:

Age (days)	Number of dark periods	Hours of darkness	Intensity (lux)
0 - 4	6	6 times 30 min = 3 hours	> 50
5	1	4	40
6	1	4	30

- Short dark periods with a maximum light intensity during the first 4 days are useful to stimulate chicks to eat and drink each time the light is on again and prevent them from huddling and sleeping in some areas (corners for example) for a long time.
- After 4 days a « single dark » period lighting programme may be implemented.
- Light intensity should be strong in the brooding area (> 50 lux).
- In dark-out and semi-closed houses, light intensity should be gradually reduced to 30 - 20 lux between 7 and 12 days.

3. FURTHER GROWTH AND DEVELOPMENT

From the second week of life, further growth and development occurs in skeletal, organs and muscle mass. If birds grow too fast, they may have poor skeleton quality, increased metabolic problems and lower resistance (more susceptible to disease). Slowing down growth during this time will help to prevent these problems.

3.1. LIGHTING

>> Recommended lighting programme:

Age (days)	Market bodyweight objective (kg)	Hours of darkness *	Intensity * (lux)
7 - 14	< 1.6	4	Decrease from 30 to 10 - 20 lux
	1.6 - 2.4	6 - 8	
	> 2.4	6 - 12	
15 - 21		4 - 10	Adapted to the behaviour and regulation
22 - 28		4 - 6	
29 days - last 2 days		4	
Last 2 days		1	

** Light duration and minimum light intensity may be subject to local regulations that must be respected.*

- A single dark period applied every day is efficient to minimise mortality, maximise leg strength and improve feed conversion.
- Dark periods are especially useful from 7 to 21 days to allow birds to grow a solid frame and thus minimise potential leg disorders.
- The optimal duration depends on final bodyweight, genotype, feed form and composition and the sensitivity of the farm to metabolic problems.
- Because the feed pattern of broilers is to eat and drink before the dark period, it is important to switch off the lights every day at the same time.
- Long dark periods increase the activity of the birds during daytime, favoring amongst other factors, the occurrence of skin scratches and tears. So, when skin injuries are already a concern, we recommend not to implement more than 4 hours of darkness after 21 days depending on local regulations or veterinary advice.
- The lighting programme after 5 days of age may be further delayed by 1 to 3 days for chicks from young breeder hens.

3.2. MANAGING GROWTH AND FEED INTAKE

>> Two main objectives:
- To improve the skeletal quality thus preparing the broiler to support compensatory growth and obtain an improved feed conversion with minimal levels of mortality, culls and downgrades;
- To minimise the level of sudden death, late mortality and ascites.

>> Once the chicks can reach easily the bottom of the feeder (normally from 10 -14 days of age), a procedure to regularly empty the feeders should be implemented. Birds should be allowed to eat almost all the feed before fresh feed is distributed, in order to reduce the amount of fine particles accumulating in the pans.
>> Feeders should be emptied daily from 20 days of age. To facilitate the emptying of feeders, one technique is to interrupt the supply of food just before the light goes out. As soon as the light comes on again, the animals will have enough appetite to consume the fine particles.
>> Weighing chicks on arrival and then every 7 days is strongly advised as a way to follow the growth.

>> Examples of uniformity (CV) according to bodyweight:

Bodyweight	1.5 kg	2.8 kg
As hatched	CV	
Good	< 10	< 12
Average	11 - 14	12 - 16
Poor	> 14	> 16

3.3. KEY POINTS

Key points to record	Key points to do/check every day
Mortality and selection (daily)	Light intensity and cycles
Amount of feed and water used (daily)	Minimum and maximum humidity
Minimum and maximum temperature (daily)	Litter quality
Weight (daily using an automatic scale; at least every 7 days manually) *	Ventilation settings
Vaccination and treatment given	Feeders and drinkers

** Where automatic weighing scales are used, it is important to ensure they are correctly calibrated. It is also best practice to manually weigh a sample of birds every 7 days to check the progress of the flock.*

4. VENTILATION

>> Ventilation management should meet 2 objectives:
- Keep the ambient parameters within a defined range depending on birds' age;
- Ensure a good distribution of fresh air around all the birds wherever they are located in the house.

>> Recommended range for ambient parameters and required ventilation rates to keep them within the range:

Parameters	Range	Required ventilation in m^3/kg/h	Factors affecting the optimum level and required ventilation
Temperature	34 to 18 °C	0.5 to 6 m^3/kg/h	Age and feather cover
Humidity	40 to 70 %	0.5 to more than 2 m^3/kg/h	Inside and outside conditions
Air speed	0.1 to 3.5 m/s	0.5 to 6 m^3/kg/h	Age, feather cover and temperature
Ammonia (NH3)	< 15 ppm	0.5 to 4 m^3/kg/h	New litter or not, litter humidity, litter treatment, litter temperature
Oxygen	> 19.5 %	0.1 m^3/kg/h	Never a limiting factor
Carbon Monoxide	< 50 ppm		Maintenance of direct combustion heaters
Carbon dioxide	< 3 000 ppm (EU)	0.5 to 0.8 m^3/kg/h	Direct combustion heaters, high heating needs, birds' metabolism
Particles		Undefined	Low humidity, litter material, birds' activity

>> Several ambient parameters are dependent on each other, so modifying one can affect others. A good example is the relation between temperature, humidity and air speed on the actual temperature felt by birds. During the first 3 weeks, each 0.1 m / sec above 0.3 m / sec is reducing the temperature felt by birds by 0.4 to 0.5 °C. Also, very low humidity at the start reduces significantly the temperature felt by chicks (up to 2 - 3 °C).
>> Fighting against the effect of high temperature is a challenge in many places and especially in humid climates where the efficiency of evaporative cooling is less. In these areas, the capacity of the house to generate high air speed (up to 3.5 m / sec) is instrumental to alleviate the heat stress on fully feathered birds.

>> Besides average ambient parameters, the distribution of fresh air to all birds wherever they are located is the key of good ventilation. In regions, where the outside temperature never gets below 20 °C, permanent tunnel ventilation can succeed in reaching this objective. Nevertheless, in most of the countries, the outside temperature may drop below 10 °C, requiring an even distribution of air inlets along the house.
>> Preventing air draughts at birds' level, when outside temperature is low, requires a sufficient level of negative static pressure in order to introduce fresh air at high speed below the ceiling so that it can be mixed with warm air before falling down on the birds.
>> On the other hand, when the temperature is higher than desired, fresh air is more efficient in cooling birds when it is directed toward them. Anyway, evaporative water cooling becomes necessary besides air speed when temperature rises above 30 - 32 °C after 4 weeks or 28 - 29 °C after 5 weeks of age.
>> The management of ventilation relies more and more on controllers and sensors, which have the ability to improve the environment over a full 24 - hour period in the absence of people monitoring the birds' condition if they are well set and regularly calibrated. Temperature sensors should reflect the conditions experienced by birds and placed at bird level; close to the floor at start, then raised progressively to prevent that the reading is affected by the presence or absence of birds underneath or around the sensor.
>> Data loggers and diagnosis tools (smoke emitters, air speed meters, etc.…) are useful to understand how ventilation actually works in a given house and find adapted solutions.

5. NUTRITION AND FEEDING

Feed intake determines the growth of animals. According to the final bodyweight objectives, stimulating or reducing the feed intake helps to achieve the optimum performance. The main factors of stimulation are feed presentation and growing conditions.

5.1. FEED PRESENTATION

>> Intake is directly linked to the quality of crumbs, pellets (hardness and durability) or mash (particle size and uniformity) placed in the chain or pan feeders.

- Provide birds with a uniform quality feed, which is adapted to their ability to eat and swallow, to reduce feeding time and energy spent to ingest.
- Broiler growth and FCR will be better if the starter feed is given in sieved crumbles or mini-pellets followed by pellets of appropriate size (diameter and length) to processing (see the table below).
- Poor feed presentation with high level of fines will have a negative impact on broiler feed intake. By instinct, chicks select large particles and avoid finer particles of the feed which imbalances the bird's feed intake. This is because finer particles contain higher levels of additives, vitamins, minerals.
- The change from crumbs to pellets is often difficult and can cause waste, above all if pellets are too big for the age of the bird and the size of their beak.

>> Optimal distribution of feed particles depending on the age of the animals and the presentation of the feed:

Age (days)	Feed presentation	Sieve Ø	
		< 0.5 mm	+ 2 mm
0 - 10	Sieved crumble	=< 10 %	=< 30 %
	Mash	=< 25 %	=< 20 %
	Mini-pellet	1.8-2 mm Ø and 4 mm long	
11 - 20	Crumble	=< 5 %	=< 50 %
	Mash	=< 20 %	=< 30 %
	Pellet	2.8-3.0 mm Ø and 5.0-6.0 mm long	
> 20	Mash	=< 15 %	=< 40 %
21 - 30	Pellet	3.0-3.5 mm Ø and 6.0-7.0 mm long	
> 30	Pellet	3.2-4.0 mm Ø and 7.0-8.0 mm long	

Fig. 8 – Chick starter crumble

Fig. 9 – Good pellet feed

Fig. 10 – Coarse mash feed

5.2. NUTRIENT RECOMMENDATIONS

>> Broiler nutrients recommendations: in grams per 1 000 kcal (Mcal) of metabolisable energy:

PHASE		STARTER		GROWER		FINISHER		FINISHER 2	
Broiler 1.8 - 2.2 kg (age in days)		0 - 10		10 - 22		22 - end		-	
Broiler 2.2 - 3 kg (age in days)		0 - 10		10 - 22		22 - 38		38 - end	
Metabolisable energy	kcal/kg	2850 - 3000		2850 - 3050		2850 - 3200		2850 - 3200	
	MJ/kg	11.9 - 12.6		11.9 - 12.6		11.9 - 13.4		11.9 - 12.6	
Min. amino-acids		Tot.	Dig.	Tot.	Dig.	Tot.	Dig.	Tot.	Dig.
Lysine (g)		4.69	4.23	4.16	3.70	3.60	3.21	3.41	3.00
Methionine (g)		1.88	1.69	1.70	1.52	1.51	1.35	1.47	1.29
Meth. & Cystine (g)		3.56	3.17	3.20	2.81	2.81	2.47	2.66	2.34
Valine (g)		3.65	3.21	3.27	2.85	2.88	2.50	2.72	2.37
Isoleucine (g)		3.12	2.75	2.81	2.44	2.47	2.15	2.34	2.04
Arginine (g)		5.04	4.44	4.50	3.91	3.94	3.43	3.72	3.24
Tryptophan (g)		0.79	0.68	0.69	0.59	0.63	0.55	0.59	0.51
Threonine (g)		3.16	2.75	2.81	2.44	2.47	2.15	2.34	2.04
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Crude protein * (g)		75.0	77.0	66.0	68.0	59.5	62.5	57.5	60.0
Calcium (g)		3.27	3.43	2.85	3.05	2.49	2.67	2.28	2.46
Av. Phosphorus (g)		1.60	1.65	1.45	1.50	1.23	1.31	1.14	1.23
Sodium (g)		0.52	0.75	0.50	0.65	0.48	0.57	0.48	0.57
Chloride (g)		0.52	0.80	0.50	0.70	0.50	0.70	0.50	0.70

** Diets should be formulated based on minimum digestible amino acid levels to keep excess protein levels to a minimum.*

>> From the above table, nutritionists can adjust nutrient levels according to their choice of energy level or age. See two examples of diet specifications in Appendix 3 - page 11. Do not hesitate to contact your Hubbard Representative for the best options for special conditions such as using mash feed or hot climate conditions.
>> Vitamin and Mineral recommendations are subject to legal limits in some countries. The latest recommendations are available on request.

5.3. WITHDRAWAL FEED

>> A withdrawal feed is required when pharmaceutical feed additives are used to avoid residual carcass contamination at processing. Refer to local legislation to determine the withdrawal time required.

5.4. SUPPLEMENTAL WHOLE GRAIN FEEDING

>> If supplemental whole grain is added, make sure the dilution is taken into account when the compound feed is formulated to keep the nutrients at the recommended levels.
>> The grain may be added after 7 - 10 days of age. Start with 1 to 5 % inclusion rate, then add up to 10 % in the grower and 30 % in the finisher (up to 40 % for heavy broilers). Inclusion rate will depend on the feed composition.
>> Whole grain should be removed two days before catching to avoid carcass contamination at processing.

5.5. FASTING

>> A minimum of 8 hours of fasting, subject to local regulations, is required in order to avoid carcass contamination at processing through fecal ejection and feed left in the crop.
>> Water should remain available until catching.
>> Lights should be dimmed to avoid birds from eating wasted food in the litter.

6. TROUBLESHOOTING

Observations	Causes	Corrective actions
Liveability first week < 99 %	Chick quality	Check with the hatchery
	Starvation	Check feed availability and quality and light
	Dehydration	Check water availability and quality and light
	Environment	Check house environment parameters
	Disease	Post mortems on dead chicks/Vet advice
High mortality rate in late growth	Metabolic diseases	Check house environment parameters, lighting programme (growth control), feed quality
	Leg problems	See leg problem section
	Infectious diseases	Post mortems on dead chicks/Vet advice
Poor growth the first week	Chick quality	Check with the hatchery
	Environment	Check house environment parameters, lighting programme (day length)
	Nutrition	Check pre-starter diet availability and quality
	Water intake	Check water availability and quality adjustment of drinkers/nipples, n° birds per drinker, access
	Disease	Post mortems on dead chicks/Vet advice
Poor late growth	Environment	Ventilation settings
	Nutrition	Check feed availability and quality
	Water intake	Check water availability and quality and nipple flow rate
	Disease	Post mortems on dead chicks/Vet advice
Poor uniformity	Chick uniformity at placement	Check with the hatchery
	Stocking density	Check stocking density is not too high
	Feed intake	Check feeder access and feed quality
	Water intake	Check drinker space and water quality
	Environment	Check house environment parameters
	Disease	Vet advice
Poor feed conversion	Poor growth	See poor growth sections
	Poor feed digestion	Post mortem for examining gut lesions
	Poor feed intake	Check feed quality, feed form and feeders
	Feed wastage	
Leg problems	Nutrition	Check calcium, phosphorus, vitamin D3, chloride levels in diets
	Excess early growth	Slow down the growth with the lighting programme or feed restriction
Poor feather cover	Environment	Check house temperature is not too high
	Nutrition	Check the feed content in methionine and cysteine
Poor litter quality	Environment	Use an alternative bedding source
		Check stocking density is not too high
		Check ventilation is sufficient and well distributed
		Check if water spillage
	Nutrition	Check protein content in diets is not in excess
		Check salt content in diets is not in excess
	Disease	Vet advice regarding infectious disease
Carcass quality problems	Breast blisters	Check litter quality at late age
	Pustules	Check litter quality at early age
	Bruises	Check handling and management procedures
	Skin tears	
	Fractures	
	Fatness	Check nutritional balance of diets
		Check house temperature is not too high
	Scratching	Decrease light intensity
		Check access to feed and water
		Check care takers behaviour (walking speed)

APPENDIX 1: OPTIMAL CONTROLLED HOUSE ENVIRONMENT

Age (days)	Temperature (°C)			Relative humidity (%)	Air speed (m/s)	Ventilation (m^3/kg live weight/hour)
	Using brooders *		Whole house heating			
	Under brooders	Side of living area				
0	35-38	31	33	40-60	0.1 to 0.3	Minimum ventilation rate 1.5 to 0.8
3	34	30	31-32	40-65		
7	32	29	30	50-65		
14	29	28	28	50-65	0.3 to 2.0	
21	27	25	25-26	50-65		
28		22	22-23	50-70	0.5 to 3.0	
> 35		20	20	50-70		

** For canopy / traditional brooders the thermometer height should be 10 cm from the litter and 30 cm from the edge of the brooder.*

Note: the floor temperature should be at least 29 °C at placement.

APPENDIX 2: EQUIPMENT AND STOCKING DENSITY

	Final weight (kg)	Indicative kg/m^2 at market time	
		Cold and temperate weather	Hot weather
Stocking density	1.2	35	32
	1.4	36	33
	1.8	39	34
	2.2	41	35
	2.7	42	36
	3.2	42	37
	Follow the local regulations if different than above. Overstocking lowers the potential for optimum performance due to the reduced growth in the latter part of growing and poor uniformity, and the increase in FCR, mortality, culls and rejects.		
Water system	Round	1/100 birds	
	Trough	2 cm/bird	
	Nipples	1/10-15 birds	
	Nipples: ensure that water pressure is constant through the complete length of the line. No residue or disinfectant in water, no clogged nipples. Flow rate capacity: > 40 ml/min side action and > 60-80 ml/min bottom action.		
Feed system	Pans	1/60-70 birds	

>> Good water quality at drinking point requires constant efforts during the flock and in-between cycles. This is due to the fact that biofilm builds up very fast inside water circuits exposed to optimal temperature for micro-organism growth. In addition, water additives are often feeding the biofilm.

>> Efficient cleaning procedures, followed by disinfection during the empty period followed by persistent water treatment, use of organic acids / hydrogen peroxide at drinking dose and regular circuit flushing are the basis for a good water quality and optimal gut health.

>> For more details about water quality management, you can refer to the Technical Bulletin ***"Water quality for breeders and broilers"*** available on Hubbard website or on demand to your contact.

APPENDIX 3: NUTRIENT RECOMMENDATIONS

>> Example of diet specifications for broilers with a slaughter weight of 1.8 to 2 kg at 30 - 34 days:

PHASE		STARTER		GROWER		FINISHER	
Age (days)		0 - 10		10 - 22		22 - end	
Metabolisable energy	kcal/kg	3000		3100		3200	
	MJ/kg	12.6		13.0		13.4	
Min. amino-acids		Tot.	Dig.	Tot.	Dig.	Tot.	Dig.
Lysine (%)		1.41	1.27	1.29	1.15	1.15	1.03
Methionine (%)		0.56	0.51	0.53	0.47	0.48	0.43
Meth. & Cystine (%)		1.07	0.95	0.99	0.87	0.90	0.79
Valine (%)		1.10	0.96	1.01	0.88	0.92	0.80
Isoleucine (%)		0.94	0.83	0.87	0.76	0.79	0.69
Arginine (%)		1.51	1.33	1.40	1.21	1.26	1.10
Tryptophan (%)		0.24	0.20	0.21	0.18	0.20	0.18
Threonine (%)		0.95	0.83	0.87	0.76	0.79	0.69
		Min	Max	Min	Max	Min	Max
Crude protein (%)		22.50	23.10	20.5	21.1	19.04	20.00
Calcium (%)		0.98	1.03	0.88	0.95	0.80	0.85
Av. Phosphorus (%)		0.48	0.50	0.45	0.47	0.39	0.42
Sodium (%)		0.16	0.23	0.16	0.20	0.15	0.18
Chloride (%)		0.16	0.24	0.16	0.22	0.16	0.22

>> Example of diet specifications for broilers with a slaughter weight of 2.5 to 3 kg at 39 - 45 days:

PHASE		STARTER		GROWER		FINISHER		FINISHER 2	
Age (days)		0 - 10		10 - 22		22 - 38		38 - end	
Metabolisable energy	kcal/kg	3000		3100		3150		3200	
	MJ/kg	12.6		13.0		13.2		13.4	
Min. amino-acids		Tot.	Dig.	Tot.	Dig.	Tot.	Dig.	Tot.	Dig.
Lysine (%)		1.41	1.27	1.29	1.15	1.13	1.01	1.09	0.96
Methionine (%)		0.56	0.51	0.53	0.47	0.48	0.42	0.47	0.41
Meth. & Cystine (%)		1.07	0.95	0.99	0.87	0.89	0.78	0.85	0.75
Valine (%)		1.10	0.96	1.01	0.88	0.91	0.79	0.87	0.76
Isoleucine (%)		0.94	0.83	0.87	0.76	0.78	0.68	0.75	0.65
Arginine (%)		1.51	1.33	1.40	1.21	1.24	1.08	1.19	1.04
Tryptophan (%)		0.24	0.20	0.21	0.18	0.20	0.17	0.19	0.16
Threonine (%)		0.95	0.83	0.87	0.76	0.78	0.68	0.75	0.65
		Min	Max	Min	Max	Min	Max	Min	Max
Crude protein (%)		22.50	23.10	20.50	21.10	18.74	19.69	18.4	19.2
Calcium (%)		0.98	1.03	0.88	0.95	0.78	0.84	0.73	0.79
Av. Phosphorus (%)		0.48	0.50	0.45	0.47	0.39	0.41	0.36	0.39
Sodium (%)		0.16	0.23	0.16	0.20	0.15	0.18	0.15	0.18
Chloride (%)		0.16	0.24	0.16	0.22	0.16	0.22	0.16	0.22

>> Vitamin and Mineral recommendations are subject to legal limits in some countries. The latest recommendations are available on request.

OTHER HUBBARD TECHNICAL DOCUMENTS AVAILABLE ONLINE

VISIT OUR WEBSITE FOR MORE DOCUMENTS

www.hubbardbreeders.com

All documents | All generations | All ranges | All products | All subjects | Search

BREEDER MANAGEMENT MANUAL

EFFICIENCY PLUS FEMALE - PARENT STOCK PERFORMANCE OBJECTIVES

M77 AND M99 MALES - PARENT STOCK PERFORMANCE OBJECTIVES

TECHNICAL BULLETINS

INCUBATION GUIDE

TECHNICAL POSTERS

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.

AMERICAS
HUBBARD LLC
1070 MAIN STREET
PIKEVILLE, TN 37367 – U.S.A.
TEL. +1 (423) 447-6224
contact.americas@hubbardbreedersusa.com

EUROPE, MIDDLE EAST, AFRICA
HUBBARD S.A.S.
MAUGUÉRAND
22800 LE FOEIL – FRANCE
TEL. +33 (0)2.96.79.63.70
contact.emea@hubbardbreeders.com

ASIA
HUBBARD S.A.S.
MAUGUÉRAND
22800 LE FOEIL – FRANCE
TEL. +33 (0)2.96.79.63.70
contact.asia@hubbardbreeders.com

V-2022-05 / P-2022-05