



## **DUAL-PURPOSE BREEDER MANAGEMENT GUIDE**

## INTRODUCTION

TETRA dual-purpose hybrids with high egg and meat yield and good persistence are designed for improved heat resilience, combined with excellent viability and feed conversion, which make them suitable for cage, alternative and organic egg farms in all climate conditions.

This dual-purpose breeder manual is a guideline and information source for maximizing profits and consumer satisfaction with TETRA stocks. However due to climatic or lighting conditions, special requests may require assistance from the nearest Bábolna TETRA specialist.

## TETRA – SELECTED FOR QUALITY

In recent decades, the consumer market has undergone some significant changes, resulting in additional requirements for the performance of production stocks. The key to this adaptation is a properly structured and efficient selection programme supported by a systematically developed consulting network that provides a backup for the increasingly popular Bábolna TETRA parent stocks and their progenies.

Continuous investments over the last years, such as the new pedigree farm and the high-capacity layer breeder hatchery, have created a more extensive base for selection and more efficient and safer hatching for customers. Regular market monitoring is essential for product development and to fulfil long-term needs. Hence, TETRA will continue to participate actively in product fairs and organize partner meetings in the future.

Bábolna TETRA has a well-established breeding tradition, a growing global market share and the company is determined to improve the competitiveness of its poultry

breeds. Despite the diversity of the current market, TETRA focuses on selecting the most important traits (persistency, egg quality, viability, heat resistance) and is committed to stabilising the economic performance of their stocks for all technological environments. Current test capabilities ensure that individual and group progeny tests are carried out until 95-100 weeks of age.

The success of the company's R&D programme has been significantly due to its cooperation with partner institutions over many decades. Thanks to this, results of *in vivo* (CT) examination of the birds and their produce, welfare indicators (state of plumage, pecking, etc.) and behavioural observations have been used in the selection index of pure lines for years. Intensive selection work continues to preserve breeds' calm nature and aims to eliminate beak trimming.

Bábolna TETRA Ltd.

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## GENERAL RECOMMENDATIONS AND BIOSECURITY OF POULTRY FARMS

### General Rules

- Isolation of the house is vitally important for disease control.
- The movements of people are the largest threat to isolation as they may bring infection onto the farm. Ideally, shower facilities and farm clothing are provided for all employees and visitors.



- Keep out cars and other vehicles from the farm area, allow minimal traffic only. Always use sanitizing liquid for proper disinfection.
- If the above protective facilities are not fully available, access to the farm should be limited to occasions when necessary. People entering the farm must wear clean coveralls, new plastic or cleansed rubber boots and a head cap.
- Disinfectant footbaths should be placed at the entrance to each house and replenished with fresh disinfectant daily.
- Doors must be kept locked at all times to prevent unwanted visitors.
- NO TRESPASSING signs should be prominently displayed on doors, and BIOSECURITY ZONE signs should be fixed at the farm entrance to warn visitors of possible disease transmission.

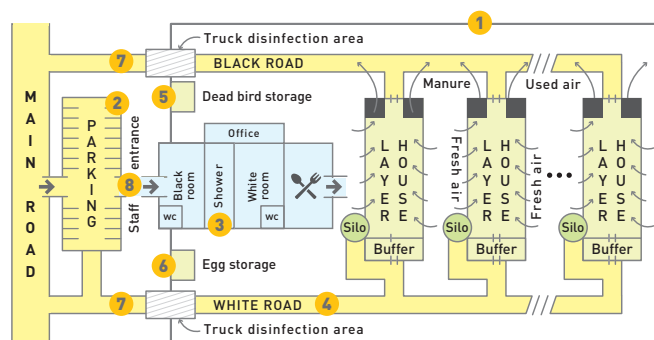
### The Importance of Biosecurity

Pathogens can infect a flock via feed, wild birds, rodents, insects, day-old chicks, visitors, trucks, equipment, and other flocks. These pathogens, such as bacteria, viruses, and fungi, can cause poor performance and outbreaks of diseases. Therefore, TETRA takes disease prevention very seriously. Preventing these problems is far easier than curing or terminating a flock.

### Plan and Build

Before building a farm, consider some essential facts. It is best to start with good planning and attention to detail; otherwise, altering the farm after construction will be more challenging.

#### Farm Layout



1. Fence around the farm
2. Parking facilities
3. Black and white changing rooms
4. Way to silos
5. Dead bird storage
6. Egg storage
7. Entrance for vehicles
8. Entrance for people

### Location

Build the farm as far as possible from any other farms to reduce the risk of contamination. Avoid places located close to busy motorways, where poultry transfer is very common. Prevent ingress of airborne hazards.

## Single-age Flock

Avoid horizontal contamination by housing single-age flocks only. One farm should have chickens of the same age and same breeding level only. Make sure growing and laying farms are separated. Hatcheries located close to feed mixing plants and slaughterhouses increase the transmission of infection.

## Visitors

Follow the black (dirty) and white (clean) principles. Erect a fence around your farm with a closed entrance, and put an UNAUTHORIZED ENTRY PROHIBITED sign on it. Everything outside the farm is “black” and “white” inside. Minimize the number of visitors, let them in only when required. Set up parking facilities outside the fence. Visitors are not allowed to enter by car.

## Around the Poultry Houses

The surroundings of the houses are to be kept clean. A tidy area helps exclude wild birds from the premises. Clean and place a 0.5-1 m strip of stone close to the wall of the poultry houses to keep rodents out. Construct the wall with smooth stainless materials to easily wash it with detergent or disinfectant.

## Personal Hygiene

When entering, use boot and hand disinfectants. Have a “black and white” clothing room inside the biosecurity building, at the fence line. Visitors must change their clothes and remove their personal belongings. Before entering the poultry house, one has to change boots and use them only inside the house. Wear different boots on the farm and inside each house. Keep your environment clean: sweep and clean the biosecurity rooms, the poultry house entrance, and the surrounding roads.

## Traffic inside the Farm Premises

Ideally, no vehicles should enter the farm.

- Feed: Put silos near the fence so the truck can fill them from outside.
- Dead birds: Collect them at least once a day and place them in a collecting box along the fence line. The box has to be closed and preferably cooled. The frequency of removal also depends on the temperature conditions.

- Egg storage: Place the egg storage building far from other areas.

If vehicles delivering day-old chicks, litter, manure, or the slaughterhouse lorry enters the farm, disinfect them thoroughly, especially the wheels, with a high-pressure washer. Please consult the veterinarian about choosing a suitable disinfectant. If it is necessary for the drivers to get out of the truck, they must wear disposable clothes and boots. Entry to the poultry house is prohibited for the drivers.

## Records of Visitors

Keep records of visitors with the following data: name, purpose of visit, date, and the name of the poultry facility, hatchery, slaughterhouse, and feed mill visited in the last two weeks. If one must see more than one flock, follow the following rules: visit the younger flocks first and then the older ones; the higher then the lower breeding level. Record everything in the visitors' book.

## Cleansing and Disinfection

The most effective way to reduce the negative impact of disease-causing pathogens on the growth and the subsequent performance of a flock is to avoid exposure to these organisms. A good sanitation program and effective isolation plans are vital to achieving this. Cleansing and disinfection are of prime importance to prevent reinfection of the new flock coming to the farm. After depopulation, remove all the hiding birds and bodies. An insecticide program is most effective when applied immediately in a still-warm house environment.

Dismantle the removable parts of the equipment, and clean up manure and litter. Transfer the litter far from the farm to a fermentation plant, but do not spill it onto the road during transportation. Remove residue feed from the silos, bins and feeders. Dry clean as soon as possible after the old flock.

Soak the inside of the house and the equipment for hours, use detergents and sufficient liquid.

High pressure cleaners clean effectively, using active detergents in cold or hot water. Ensure the staff also clean feeders, drinkers, fans, air inlets and outlets. Rinse everything with water and let the equipment and the house dry.



*Always use a broad spectrum sanitizing agent to disinfect the poultry houses between flocks properly.*

Use a multi-level disinfection programme to reduce the number of germs in the house. Maintain walls, floors, fan blades, lights, slats, nests, feeders and drinkers, both outside and inside. Care for closed areas, like sanitary and storerooms. Effective disinfection requires clean surfaces without any remaining dirty or organic material. Calculate the dosage and the application time of the disinfectant correctly. Use disinfectants with antiviral, antibacterial and antifungal effects. Sporocides can kill very resistant parasite spores as well. Change active ingredients frequently and monitor the impact by microbiological tests. Mind that some disinfectants do not work well under low temperatures. They can harm human health, so follow instructions thoroughly and provide personal protection.

The cleansing and disinfection should be done in chicken houses and around the farm, such as in biosecurity buildings, feed stores and litter stores. Make sure to cleanse vehicles, tools, clothes and boots.

## Water Hygiene

Water and watering systems require regular checks and maintenance. The water quality has to be checked every 6 months for microbiological and chemical compounds. Chlorinate water when necessary. When the house is empty, use effective detergents and disinfectants to remove biofilm and carbonate deposits from the pipeline.

When birds are in the house, water lines must be flushed frequently during hot weather, plus before and after vaccination or medication.

## Feed Hygiene

Feed quality is of prime importance. Buy feed from certified and controlled suppliers. When mixing feed on the farm use high-quality ingredients and premixes. Nutritional content, energy, protein balance, macro- and microelements, and enzymes are necessary for good development and performance. Avoid microbial contamination (bacteria, fungi) and toxins (mainly mycotoxins). Heat treatment reduces bacterial germs. Use toxin-binding substances when needed. For *Salmonella* control, apply appropriate supplements. Heat treatment produces better homogeneity after handling. Commercial birds and breeders prefer crumbled feed. Hygienic storage and transportation of feed are also necessary. Keep silo and feed bin surroundings clean, and remove spilt feed immediately not to attract wild birds. Silos must be emptied and cleaned regularly, so two silos are recommended to each house.

## Wild Bird and Rodent Control

Wildbird and rodent control is the first line of defence against transmitting dangerous diseases. Use bird nets to prevent viral, bacteriological and parasitic infections. Doors and walls must be intact to prevent entry of wild animals. Avoid spilling feed, and remove dead birds and broken eggs. Implement a rodent control program.

## HOUSING

Male line males and male line females are raised separately because of the different needs and feeding programmes of both sexes. On the other hand, female line males and female line females can be raised together. Parent stock males and females are raised separately also.

### Before the Arrival of the New Flock

Raise the house temperature to 30-32°C for the male lines and 34-35°C for the female lines 24-48 hours before the chicks' arrival to ensure that the equipment warms up as well. The desired relative humidity should be 60-70%. This humidity level has to be maintained for at least three weeks.

- Set light clocks to 23 hours daily with a light intensity of 30-50 lux for the male lines and 20-30 lux for the female lines. If shadows are cast onto drinkers/nipples, the use of droplights is suggested to eliminate them.
- Trigger nipples to ensure that they are working and set them at the proper height. Nipples should be at the chick's eye level, and bell drinkers should be placed on the floor. Supplemental drinkers can be used during floor brooding and removed slowly once the chicks are established and are using the central drinking system.

### Checklist

- Chick behaviour is the best indicator of temperature. By following some simple rules, we can ensure the conformity of the chicks during this sensitive period.
- If the birds are calm and quiet and are spread equally in the house, it means they feel comfortable.
- Always measure the temperature at the bird's level.
- Besides temperature, it is essential to maintain proper humidity as well. Relative humidity has to be kept between 60-70% by evaporating water (floor brooding) or watering the walks (cage brooding), if necessary.



## GROWTH MANAGEMENT

- Flock uniformity and body weight indicate the future performance of the birds.
- Restricted feeding program is required for the male lines and for the breeder males throughout the growing as well as the production period, on the other hand, female lines and breeder females are fed ad libitum.
- Male line males and male line females are raised separately, as well as breeder males and breeder females also. Female line males and female line females are raised together.
- Ensure that targets stated in this manual are reached at the points of chick development (change in feed type).
- Keep records of mortality, feed intake, feed conversion ratio, water consumption and weekly body weight.

### Floor System

Day-old chicks must be housed in clean, disinfected and adequately prepared buildings. The room temperature should be 30-32°C for the male lines and 34-35°C for the female lines, but fresh air is very important too, so minimum ventilation must be provided from the beginning. Use clean, mould-free straw or wood shavings for litter. Automatic feeders must be filled up so that chicks can see the feed in them. Place chick-paper alongside the drinkers' lines and scatter feed on it in a thin but evenly distributed layer. Keep the chick paper dry, a 5 cm distance from the drinkers' lines is recommended. Use clean, scale and biofilm-free nipple drinkers for water supply. Water should be warmed up before the chicks' arrival to 20-25°C. The height of the drinkers has to be checked frequently. A water droplet on the nipple helps birds to find the drinkers easily. Illumination is crucial for birds to find feed and water as soon as possible. Perches are recommended from the early days as they help chicks become accustomed to the proper usage of a laying house with slatted floors and scratching areas. Recommended perch length: 15 cm/bird. Stocking density: 10-12 chicks/m<sup>2</sup>.

### Cage System

The conventional way of rearing breeder chicks in cages is still allowed in many countries, but animal welfare and state regulations can differ. We suggest placing chick-paper on the bottom of the cages and scattering feed on it. Chick paper is used for 4 days and during this period, a thin layer of feed must be frequently put on it. Make sure that chain feeders are well

illuminated. Place day-old chicks only on the second and third cage levels and check them frequently to see whether they find water and feed. Trigger the drinking nipples for checking and to show the chicks the water source. After one or two weeks of rearing, chicks can also be distributed to other cage levels.

### Stocking Density

Environmental factors, such as type of housing, ventilation and temperature, have a greater effect upon stocking rate than genetics. The recommendations are given as a guide for floor and cage rearing. These rates should be reduced by 2-3% for each 1°C rise in temperature.

### Feeding Space

The standard data should be regarded as the minimum requirements for a satisfactory performance.

### Drinking Space

Water is an essential nutrient by itself. It can also influence nutrient intake by controlling feed intake. Restriction on water intake will cause a voluntary reduction in feed intake.

There should be a minimum light intensity of 20 lux at bird level to ensure that all birds find water when initially housed. It is essential at one-day old and where a change of drinking system occurs when moving birds into the laying house.

## Lighting

The temporal resolution of birds is considerably higher compared to human vision. Therefore, low-frequency (50 Hz alternating current) fluorescent tubes and energy-saving bulbs are unsuitable for lighting poultry houses as birds perceive them as continuous flickering, acting as a constant source of stress, while human sight would not interpret this rate as intermittent light. Proper light sources for poultry houses provide warm white light (colour temperature: 2700-3000 K) with frequencies higher than 2000 Hz. If such light sources are unavailable, traditional light bulbs can be used as well. Concerning the colour of the different light sources, only red light has been proven to have a calming effect on birds and to have efficacy against pecking and cannibalism. The lighting programme has to be adjusted to natural day and night light conditions. The application of a dimmer would considerably reduce stress by gradually brightening and dimming light within 30-45 minutes. In case of discontinuous lighting of the poultry house equipment, lighting should be switched on first in the morning, and it should be the last one to be switched off in the evening.

## Climate Control

During the rearing period, temperature is a key factor in determining the well-being of the birds. The poultry house must be equipped with an air conditioning device capable of providing minimal ventilation, or you must provide 4.5 m<sup>3</sup> fresh air/body weight kg. The birds are sensitive to draught thus it should be avoided. Ammonia concentration in the air must be kept under 10 ppm and carbon dioxide under 2000 ppm, while dust particle numbers should be as low as possible.

## Heat Stress Prevention Management

Climate change is affecting all parts of the world, which is why Bábolna TETRA has been paying particular attention to genetically improving the heat tolerance of their birds. Heat stress can cause economic loss. From a management perspective, several methods can help, including reducing stocking densities, better placement and ventilation, and proper cooling systems.

Adequate ventilation is critical to avoid heat stress during the hot months. For the poultry house climate to be pleasant, the fans must have a capacity of at least 3.5 litres/second per bird. It is essential to check daily that the fans are working well, the blades and lamellae are clean, and the belts are set up correctly. Poorly maintained fans operate with lower efficiency. In addition to the fans going all day when it is hot, they also need to run at night and early morning to bring in cooler air.

The air inlets should be adjusted to achieve a uniform airflow throughout the building. Roof ventilation may also be required when summer temperatures are extremely high. Modifying house ventilation and cooling systems can help create a suitable climate, requiring high construction and maintenance costs. Some of the above methods are not applicable in some regions and companies of developing countries due to financial issues.

Maintaining the water system for cleanliness and functionality is another critical task in preventing heat stress. Check the drinking system systematically to ensure that all parts are working perfectly.

Pedigree flocks have been selected for years to perform better at high ambient temperatures. Although these birds tolerate heat without significant performance loss, management responsibilities are inevitable. Providing more feeding or watering surfaces, lower stocking densities, adequate nutrient supplementation, and possibly improved ventilation may be sufficient.



## Beak Trimming

Before a decision is made concerning beak trimming, local law and animal welfare regulations must be studied. More and more countries forbid this kind of treatment. Beak trimming needs not be carried out routinely when stock is kept in a controlled environment. If experience from previous flocks suggests that it is necessary, it will be worthwhile checking all other aspects of management first before embarking on a beak trimming programme. Males must not be beak trimmed.

The provision of more feeders and drinkers, more space per bird, appropriate nutritional components or improved ventilation may be the right action to take.

- Infrared treatment is the most recommended method for beak trimming, which can be done soon after hatching, when chicks are dried up.
- Beak trimming can also be done at about 7-8 days of age. In order to reduce stress, it should be delayed for flocks where brooding conditions have not been suitable or adequate.
- In open-sided housing, routine beak trimming is recommended, as both bright light intensities and high temperatures can produce undesirable behaviour. Make sure that all female birds are properly and evenly beak trimmed.
- Each female bird should mature with a rounded, but slightly shortened beak and be able to feed.

## LIGHTING PROGRAMMES

- A lighting programme is only effective if no direct sunlight enters the building, otherwise the time of maturity can vary. Due to this reason, flocks moved to lay in autumn will start to produce eggs a few weeks later.
- The principal function of a lighting programme is to influence the age at which a flock becomes sexually mature.
- Age, and more particularly body weight at first egg are the main factors which determine egg output. Egg numbers during the laying period decrease by 3-4 eggs for each 10-day delay in age at first egg.
- Bright light is necessary for chicks to feed and drink properly. Therefore, light intensity should be monitored, especially in the first 2-3 weeks.

### Controlled Environment (dark house)

- When birds are reared in a controlled environment, the onset of production is relatively easy to handle.
- After transferring the birds, the hours of lighting must be increased to 14 hours. To maintain a high production level, day length can be increased gradually to 16 hours.
- Do not decrease the length of lighting during the production period.
- Full benefits will not be obtained if the house is not light-proof, especially when birds are being reared during a time of naturally-increasing day length. Under such circumstances, early sexual maturity and small egg size are potential problems.



### Open-house Environment

- Light stimulation is not necessary when birds are transferred to an open-sided or free range environment.
- Any adjustment to the lighting programme depends on the following:
  - natural daylight increases
  - natural daylight decreases
- For example; when the flock starts producing in late winter/spring or when the natural day length increases in the Northern Hemisphere, it is advised not to transfer them before natural sexual maturity (21-22 weeks of age).
- Personalized lighting programmes for regional climatic and lighting conditions are available from your Bábolna TETRA representative.



## NUTRITION

- **Male lines:** Ad libitum feeding is recommended in the first week of life and portioned feeding until the end of production. Males must be raised separately in the growing period, but getting the same type of feed (starter I, starter II and grower) as the females. From 23 weeks of age breeder male ration is advised. During production, separate feeding is needed for females and males with rooster exclusion grids and rooster feeders..
- **Female lines:** Ad libitum feeding from day-old until the end of the production. Males and females are raised together and get the same type of feed.
- **Parent stock level:** Ad libitum feeding is recommended in the first week of life and portioned feeding until the end of production for the males. Males must be raised separately in the growing period, but getting the same type of feed (starter I, starter II and grower) as the females. From 19 weeks of age breeder male ration is advised. Ad libitum feeding from day-old until the end of the production. for the females. During production, separate feeding is needed for females and males with rooster exclusion grids and rooster feeders.

The genetic potential of breeders with high performance can only be exploited when their biological needs are met. Giving complete feed is necessary, with specialized nutrient content which is adapted to the animals' needs in each growing and production phase.

### The Basics

#### Energy and Nutrients

Due to the high productivity of breeders, the demand for nutrients is relatively high and varied. Scientific studies classified up to almost 40 (macro and micro) nutrients that are to be supplied in appropriate concentrations and ratios.

Energy demand is considered to be the most crucial factor. The recorded feed digestion (burning) provides energy for the body, a part of which (metabolizable energy or ME) can be utilized for metabolic processes such as maintenance, weight gain and production.

#### Proteins and Amino Acids

Protein is the highest proportion of components present in the body, feathers and eggs; therefore it is essential for growth and production. Although it still has great significance in practice, the "crude protein" content has become less valued in scientific circles. Simple laboratory tests ( $N \times 6.25$ ) and rapid tests are available to monitor the protein content of the feed, which is necessary to ensure the reliability of the manufacturing plant.

Protein added to feed is broken down into amino acids, from which the body compiles its own proteins, but their genetically-encoded amino acid composition and sequence are different. About 20 different amino acids are required, some of which poultry cannot synthesize, known as "essential" amino acids, as well as those "non-essential" amino acids only found in a minimal amount in feed. Methionine and lysine supplements are now required in almost all poultry feed, with threonine and valine usually being indicated on the values that set limits on excessive protein reduction. Birds require cysteine for their plumage; however, it can be replaced by sulphur-containing methionine if it is not available.

#### Fats, Oils, Fatty Acids

Components of fats/oils are fatty acids. Their ratio affects their melting point (solid "fats" and liquid "oils"). All energy provider compounds, like fatty acids, especially linoleic acid, are essential for the growth and development of skin and feathers, the development of the reproductive tract and are also considered to be essential in terms of eggshell formation. The linoleic acid content of maize, sunflower and soybean oil is favourably high.

## Minerals

Calcium (Ca) and phosphorus (P) are the most critical components of eggshell and bone, and are also present in other body tissues. Grain-based feeds are poor in calcium, so supplementation of ground limestone (calcium carbonate, 38% Ca) is necessary. However, plants contain a higher proportion of phosphorus but, because of phytate complex, the bioavailability of the P rate is only 10-40%. Previously, a large-scale mineral phosphate supplement was needed, although today, because of the wide-range use of phytase enzyme, P-utilization has improved significantly.

Sodium (Na<sup>+</sup>), potassium (K<sup>+</sup>) and chloride (Cl<sup>-</sup>) ions play an essential role in blood and osmotic pressure, cell pH maintenance and enzyme activation. Sodium supplements with common salt (NaCl) usually satisfy the chlorine demand. In the case of heat stress, sodium carbonate supplementation is recommended. The potassium (K<sup>+</sup>) content in plants is already high.

## Vitamins, Microelements

Vitamins are micronutrients that are essential for maintaining health, fertility and performance. Each vitamin has a separate role, so other vitamins cannot replace it. Vitamins – with few exceptions – cannot be synthesized, so they must be mixed in feed.

A few milligrams or micrograms of specific vitamins are sufficient for the supply of vital functions, but these must be provided regularly. In today's intensive technology, satisfactory results can only be achieved by a purpose-built vitamin supply.

Trace elements are components of enzymes, each of which plays a crucial role in specific metabolic processes. Regular poultry feeds contain a compound of 13 different vitamins and 7 trace elements; incorporate Vitamin C in the case of increased stress. Particular poultry feed contains the same vitamins and trace elements, but a partial absence of either micro component has a considerable negative impact on health and production.

## Other Supplements and Additives

- Regular mixing of antioxidants protects vitamins and unsaturated fatty acids.
- In recent decades, the exogenous enzymes have caused major changes and NSP-degrading (non-starch polysaccharides) enzymes have allowed a higher grade, risk-free mixing of cereals. In contrast, the phytase enzyme has strongly improved phosphorus utilization of plant components and has affected the digestibility of other nutrients favourably.

# FEEDING DURING THE GROWING PERIOD

By following the recommendations of our feeding program, described in the Management Guide, breeders reach their weight corresponding to their age. This is an essential condition for normal sexual maturity in addition to starting and maintaining a high level of production during the laying period. Throughout the various phases of development, differently composed feed is recommended for chicks, pullets and males to fulfil the nutritional requirements of the birds. The actual weight of the flock must be determined before moving on to the next level. If birds have not reached the desired weight by the end of a feeding period, any feed changes need to be delayed.

## Grain Size

Coarsely-grained ("structured") diets are the most appropriate for chicks, pullets, hens and males, although excessively coarse feed leads to selective eating whereas too fine feed structure causes reduced feed intake and, as a result, inadequate nutrition in both cases. In starter feeds (especially in the first phase) crumbs are the most appropriate, which is a firm guarantee for the feeding of young chicks in terms of microbiological status.

## Starter I, Starter II (0-3 weeks; 4-8 weeks)

Essentially, starter rations help with good skeletal and organ development plus strengthen the immune system. This is achieved by feeding starter I and starter II, in a proper ratio and adequate levels of essential amino acids for growth, immune system, feathering and skin development.

### Grower (male lines: 9-19 weeks, female lines: 9-17 weeks)

Though grower diet is the lowest density ration that birds receive with higher fibre content, it is still important that all nutrients are correctly included. Fibres positively influence digestive tract development and consequently, increase appetite. It is very important for young females to take all nutrients needed at first egg. We recommend using 5-6% crude fibre in the grower diet. Cereals and their by-products as well as DDGS can be used as a source of crude fibre.

### Pre-layer (male lines: 20-22 weeks, female lines: 18-20 weeks)

Pre-layer feed is recommended during transition from grower to breeder I period with not only a significantly increased calcium added, but also a higher level of each nutrient. Before the start of egg production, pre-layer ration is advised for 10-14 days, followed by breeder I at 5% production. Pre-layer feed should compensate lower feed intake that often occurs at the start of production. During this period, the females undergo significant physiological changes. The medulla of the layer's tubular bones develops which is responsible for the eggshell calcification in the production period.

An adequate amount of calcium is important to be added to feed during this period, for proper bone strength and eggshell quality during production. Increased levels of energy and amino acids are also desirable since these promote ovarian tissue development. The daily weight gain of 10-15 grams increases 3-15 days before the onset of laying eggs. In order to begin egg production, the 19<sup>th</sup> week target body weight should be reached and feeding of properly prepared pre-layer feed is necessary.

Strict feed restriction is necessary for the male lines and parent stock males. On the other hand feed restriction is not recommended for the female lines and the parent stock females, but weekly monitoring the body weight is essential in all lines and sexes.

**Note that male lines' diets differ from the female line ones!**

Clean water should always be available and its quality needs to be checked regularly.

### Body Weight Control during Rearing

Uniformity and regular weighing are of utmost importance. During the growing period and until peak production, birds should be weighed weekly at the same time of the day. Make sure you keep records of bird weight regularly from the first weeks of growing. Changes in body weight and homogeneity of the stock provide information about normal development of the birds. Flock growth is normal and birds are considered equal if their CV% is below 10%.

$$\text{CV\%} = (\text{standard deviation} / \text{average body weight}) \times 100$$

Female lines and parent stock females do not tend to become obese, so if weighing data do not differ significantly from the technological values ( $\pm 5\%$ ) and are recorded as homogeneous, you can feed birds *ad libitum* throughout the rearing period.

Male lines and parent stock males, on the other hand, are prone to obesity, so their rationed feeding is justified.

Nevertheless, if birds do not reach the required weight value, run feeders more frequently and give them feed of higher nutritional value.



## PRODUCTION PERIOD

### Floor System

There is a wide variety of houses made for breeders where birds can feel free on 100% litter, or there are houses with dropping pits that are covered with plastic or wooden slats. We suggest installing the slats 60-80 cm above the concrete floor, with an automatic laying nest system in the middle and feeder and drinker lines on both sides. In that type of laying house 1/3 scratching area and 2/3 slatted area are recommended. Put up resting perches (15 cm/bird) on the slats or at the walls. The best way to have a good start with a new flock is when female lines and parent stocks are transferred to the laying house at the age of 16-18 weeks and male lines at the age of 20-21 weeks. Start with the roosters and continue with the hens in 3-4 days. The drinkers and feeders should be the same type as the birds have already been using at the rearing farm. Scratching area should be covered in 1-2 cm fresh, clean straw or wood shavings. Install ladders, so birds can jump onto slats easily. Those birds that cannot find the way up by themselves, should be helped individually during the first 4 weeks. This is a good practice for the prevention of floor eggs as well. In particular, birds can be closed by bird-nets onto the slatted area for 3-7 days to get accustomed to drinkers, feeders and nests. The suggested stocking density depends on the capacity of feeders, drinkers and fans. Houses can also be equipped with winter gardens or access to free-range area.

### Cage System

There are different regulations throughout the world. Birds raised in cages are the most suitable ones for such production systems. Do not change the feed structure and stimulate feed intake by frequently repeated feed distribution. Water is essential. Check if drinkers function properly, especially on the day of housing.

### Management into Lay

Minimize variation in body weight and sexual maturity of the birds. Prepare the females for production by giving extra calcium, phosphorus and introduce larger feed particles. Slowly transfer from pre-layer feed to breeder I, when first eggs appear (>5%).

### Management during Production

Breeders are suitable for alternative keeping systems during the production period. In hot climates, it is advisable to provide shelter (house, trees, sheds) and extra drinking and living space for the birds. Controlled-environment houses are more suitable for all-year production programmes.

Body weight should be monitored every week until 30 weeks of age, then on a monthly basis.

Overweight hens lay fewer eggs, males may have mating and fertility problems during their production cycle, therefore daily feed consumption should be adjusted to the body weight standard.

### Control of Uniformity

- Body weight should be closely monitored until the onset of production. In the male lines and among the breeder males 100% individual weighing is recommended at the age of 4 and 10 weeks. 3 weight groups - low, middle and high - need to be created, with group-specific feeding, the target is to get homogenous breeders until the end of the rearing period.
- Flock uniformity must be the main target. The more uniform the flock is, the quicker the production increase. It is advised to split the daily amount of feed, giving the first round in the morning just before switching on the lights and, subsequently, distributing the rest of the feed after the peak laying hours.
- The level of feed intake in the production period is mainly affected by body weight, temperature, feathering, energy level, texture of the feed and production intensity.
- Breeder females primarily alter their daily feed intake to accommodate changes in their energy requirements. Therefore, the factors like ambient temperature etc., which influence the bird's demand for energy, will automatically affect the bird's feed consumption. If ration formulation is not modified, changes in daily intake will result in changes in nutrient intake including amino acids, vitamins, minerals, anti-coccidials that will consequently affect bird performance.

- Females do not completely adjust their feed consumption to extreme temperature or higher dietary energy concentration. In fact, high temperature or high energy concentration can significantly reduce energy intake and egg output.
- Females with low body weight lay fewer eggs, whereas higher body weight at the beginning of production will be an advantage until the peak period.

### Females without Beak Trimming

There is an ever growing number of countries and operations where beak trimming is not allowed. To prevent feed wastage and behavioural disorders, make sure you monitor and satisfy the birds' need and create a favourable environment for them. Stocking density, feeding and drinking spaces, feed, water, litter and air quality, ventilation, light intensity are the most important factors. Birds like to play with toys like straw

bales, plastic strings, limestone grits. The toys must be changed from time to time, because the birds are looking for new adventures. They also like dust baths very much, so they must be provided. Well maintained, dry litter material promotes foraging and scratching.

Well balanced and properly structured feed can prevent bad behaviour, like feather pecking or cannibalism. Too finely ground or pelleted feed should be avoided. The shorter the feeding time is, the more frequently pecking occurs. Feather eating can be inspected by checking the floor area. In normal cases lost feathers can be seen on the floor. If not, the flock is suspected for eating them and prompt action must be taken, because it could be a sign of unbalanced feeding.

Any other stress can lead to unfavourable behaviour, like strange noise, endo- or ectoparasites (red mite), or other health issues.

## FEEDING DURING THE PRODUCTION PERIOD

First eggs appear at 19-20 weeks of age (female lines) and at 21-22 weeks (male lines) and in this period, an intensive high-energy and nutritious diet is needed for the hens, with increased calcium supplementation.

## BREEDER DIETS

### Breeder I

At the start of egg production daily feed intake rises relatively slowly. At the same time, egg formation, the increasing egg and body weight gain further raises the nutritional intake of the hens. It is important to understand that the quality of nutrition has a crucial impact when birds reach peak production and on their performance. Feeding should be restricted for the male line hens and ad libitum for the female line hens, as well as for the parent stock hens. We recommend feeding breeder I with high nutrient concentrations, as long as production is expected to be over 75% at the male lines and 80% at the female lines.

### Breeder II

With aging, both egg production and the nutritional needs of the birds decrease. In order to optimize costs, lower concentration of crude

protein and amino acid, but higher amount of calcium should be included in the ration. To prevent fattening, energy or fat/oil supplementation needs to be reduced. The proper ratio of nutrients must also be closely monitored during this period. Breeder II should be fed until the end of the production.

**Note that male line hens' diets differ from the female line ones!**

### Breeder Male

Due to gender and physiological characteristics, male line and parent stock males require different feeding programs from females, both in terms of content and quantity.

## VITAMIN AND MICRO-NUTRIENT SUPPLEMENTATION

According to the general introduction stated earlier in this manual, vitamins, trace elements and, if necessary, other additives should always be present in the diet, in micro amounts. For starter I and starter II, higher doses are recommended, which may be reduced in grower, whereas a higher dose is used in breeder I-II diets. The micronutrient supplementation is uniform for all age groups.

### Limestone

In accordance with hens' calcium requirements, limestone must be present in feed in high proportions. In addition, the quantity and shape of limestone are equally important. A lower content of Ca in the diet causes a higher

feed intake, which leads to an uneven supply of nutrients. On the other hand, excess Ca supply has a controversial effect on consumption, causing the remaining nutrient supply to become insufficient.

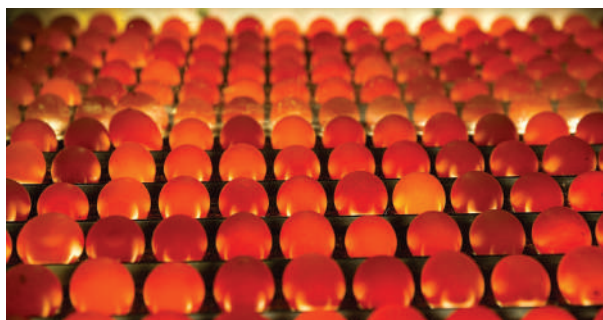
## FEEDING AND EGG QUALITY

Higher body weight reached by the end of rearing results in higher egg weight values during production. Among nutrient components, crude protein, methionine and a proportion of linoleic acid within the diet have a positive effect on egg weight.

Shell strength is a complex trait and many factors affect its quality. These include age, egg weight, the animal's behaviour, lighting programmes, feeding, disease and drugs, ambient temperature and the feeding technology used.

Calcium is the most important mineral, it plays a key role in the eggshell formation, but

other minerals, vitamins and nutrients take part in the process too. The balance of all different minerals, as well as the total amount of each component, are equally important for normal eggshell formation.



## EGG HANDLING

### Nests

- Clean egg production and floor egg minimization are influenced greatly by the provision of sufficient, well-located and maintained nest boxes. Floor eggs should be avoided, because of contamination, cracking and extra collection work. Nests should be well-ventilated to discourage broodiness and their litter replenished regularly to prevent breakage and minimize bacterial contamination.
- The numbers of laying nests must match the flock's size. Easy access, comfortable rubber floor or litter material, dark and draught-free

environment inside nest boxes are necessary for having a quiet place for the hens. Addition of lights to nest entrance that switch on 1 hour prior to house lights help "early birds" finding the nest easier. The homogenous illumination of the scratching area, 1-2 cm litter material can effectively prevent floor eggs. Electric fence along the walls could also be a tool for reducing nesting on the floor.

## How to Reduce Floor Eggs?

At the start of egg production searching for floor eggs has a primary importance. Collecting them once an hour from morning until the early afternoon, during the first 2-4 weeks, effectively reduces the number of floor eggs and has a long lasting effect for the whole laying cycle. While looking for floor eggs, hens nesting on the floor have to be placed into the laying nests. Make sure you do not disturb birds nesting in the right place, especially during the main laying period. Do not distribute feed at laying time.

## Egg Collection

- Eggs need to be collected from nests at least 4 times a day. Most eggs will be laid during the morning hours, so collection time should be adjusted accordingly.
- Floor eggs must be collected and handled separately. Percentage of floor eggs must be registered, so management factors can be changed accordingly.

## Hatching Egg Handling

- Place hatching eggs always with their pointed end down on the tray.
- Small (53 g and below), XL (73 g and above), dirty, cracked eggs are not suitable for hatching. Collect and store them separately from hatching eggs.
- When packed in a box, eggs should be cooled to egg store temperature before being packed away.
- Embryonic cell division begins while the forming egg travels through the hen's oviduct at about 41°C. As soon as the egg is laid, it cools to the temperature of its surroundings, and cell multiplication slows down.
- If eggs are to be placed into an incubator within 3 days after being laid, the optimum storage temperature is about 25°C.
- When eggs are stored for 4 or more days before setting, cool eggs to 13-16°C and keep relative humidity at about 75% to maximise hatchability.

# MALE MANAGEMENT

## Growing Period

- The first evaluation of the males' uniformity should be done at 4 weeks of age. Remove and separate underweight and underdeveloped males for 1-2 weeks. This period should be enough for them to catch up with the rest of the flock.

## Transfer

Males should have good sexual maturity at the time of transfer. Mixing females with males are carried out at 16-18 weeks of age (female lines and parent stocks), and at 20-21 weeks of age (male lines). This procedure should be monitored for various reasons:

- A good relationship among the birds and the proper development of hierarchy is essential for successful future production.
- Underdeveloped, sexually immature males should not be transferred or must be removed from the flock.
- Comb size, colour and behaviour are the best indicators of a male's libido.

- Remove aggressive males and keep them separately for observation. Hens may not be ready to accept them.
- Transfer more males than intended to keep later for selection basis.
- Ratio of males and females should be 1:10 by the offset of production. This ratio will be decreased later to 1:8-1:9 later.

## Males at Production

Soon after transfer, body weight should be closely monitored for 2 reasons:

- Sexual development;
- Males are gradually excluded from the hen's feeders, therefore technology need to be prepared for separate feeding. Loss in body weight results in early retirement and lower libido in males. On the other hand, males stealing feed from the females' feeders, when egg production is close to peak, which could result in males becoming overweight, while reduce peak production level. Monitoring female body weight and egg weight will show if this problem exist.

Males must not lose weight during production, as they may not recover from excessive weight loss. They may become dull and inactive and need to be removed from the flock, eventually.

Daily feed intake must not be reduced.

Body weight must be monitored every 4 weeks after peak.

Litter must be kept dry to avoid leg disorders, which affects the males' activity.

Strewing grains in the litter will also positively stimulate mating.

### Mating ratio

- To maintain fertility in the stock, adequate number of sexually active male is required. As birds age, and egg production level decrease, lower number of males is needed, so inactive males can be removed from the flock.
- Daily feed always needs to be adjusted to the changing flock size. Typical ratio is 8-9 males to 100 females.
- However, more males may be needed in hot climate, where their libido is lower due to the high temperature. Mating ratio should be reviewed fortnightly.
- Removal of non-working males needs to be an ongoing process during the production period.
- A so called "over-mating", when we have more than enough males in the building will result in abnormal behaviour and interrupted mating. Excessive loss of feathers on the back of the hen's head will indicate this problem.
- Moreover, feather loss and injuries on males due to constant fighting will cause welfare issues.
- If problems not solved immediately, fertility would decline in a very short period.
- Mating problems need to be monitored from 25 weeks of age.



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