Das Erfolgskonzept:
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INFORMATION
ON TURKEY GROWING

CONTENT

1 INTRODUCTION

One of the basic principles and objectives of the Kartzfehn Premium Concept is to provide advice and support at all times during the planning and implementation of turkey rearing projects. Accordingly, this brochure presents the most important guidelines and indicators for turkey rearing in an established form.

Besides providing basic knowledge for newcomers, "Information on Turkey Growing" is designed in such a way that professionals can also refer to it at any time as a framework and to help in their decision-making during their daily work with turkeys. This brochure serves as a practical compendium, in addition to providing the German federal benchmark figures concerning turkey rearing and the health-monitoring programme standards.

However, adapting to the respective operating conditions is essential to successfully raising turkeys when selecting management measures, not just blindly following pre-defined regime specifications. A basic prerequisite is regular, systematic observation of the birds, so that, ultimately, it is the birds that decide the regime.

Experience with other poultry species can only be applied to turkeys to a limited extent. Health status, species-appropriate design of the management methods, feed, as well as environmental conditions, are essential conditions for developing the full genetic potential of the turkeys.

Note: This information brochure can also be accessed on our homepage (www.kartzfehn.de), where you will find other interesting links on specific topics.

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2 EXPERT KNOWLEDGE

All turkey farmers and farm hands must demonstrate their expert knowledge pursuant to the German federal benchmark figures for a voluntary agreement on rearing turkeys.
Such specialist knowledge is recognised for:

- Completed qualification as an animal husbandry worker, specialism in poultry,
- completed qualification as a farmer,
- completed degree in agriculture or veterinary studies,
- minimum 3 years of being personally responsible for looking after turkey stocks of over 500 animals, with no animal welfare-related complaints.

The turkey farmer is under the obligation to regularly attend relevant training courses and to keep records on attendance. Furthermore, it must be ensured that all individuals looking after turkeys have up-to-date knowledge and skills relevant to animal welfare. Examples include:

- Basic knowledge on turkey rearing and the required technology
- Appropriate handling of healthy, diseased or injured turkeys in accordance with animal welfare law
- Methods for anaesthetising and emergency emergency killing that comply with animal welfare law
- Knowledge on biosecurity and hygiene
- Needs-based supply of feed, water and litter for the turkeys, knowledge in the field of housing climate management
- Recognition of aberrations in the appearance of the flock, especially health disorders

3 HYGIENE

Promotion of animal health is of the utmost importance to successful turkey rearing. Statutory requirements, for example, for absence of Salmonella (Poultry Salmonella Regulations) and the avoidance of animal epidemics, such as avian influenza (Fowl Pest Regulations), underline the importance of uncompromising hygiene in turkey rearing.

The emergence and spread of diseases can be counteracted by careful planning and implementation of hygiene measures. The steps to be aimed for must be designed so that all harmful bacteria, viruses, fungi, parasites and insects are largely eliminated from the animals' environment.

All hygiene measures must therefore be carried out systematically to prevent apparently insignificant individual factors causing a chain reaction that can lower the level of hygiene across the entire farm.

NOTE:

Strict separation of the black (external) and white (internal) areas

3.1 SITE

- Isolated location in relation to other housing, especially poultry housing, and adequate distance from other livestock and their waste products. Take the main wind direction into consideration.
- Fencing around the farm and solid housing forecourts that are easy to clean.
- Generous spatial separation of rearing and fattening houses to avoid possible pathogen transfer from the birds in the final fattening stages to the newly housed poults.
- No cross-contact with other poultry stocks and no other poultry on the farm.

AIM:

No different age batches held in any one farm!

3 HYGIENE

3.2 HOUSING HYGIENE

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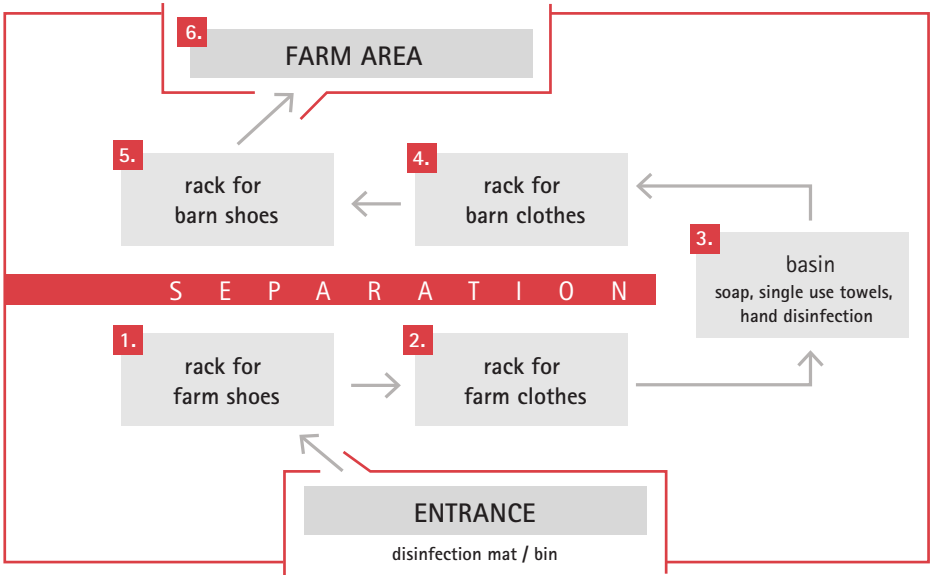
BESUCHERBUCH

DATUM	NAME	FIRMA	GRUND DES BESUCHS	UNTERSCHRIFT

- All external visitors are to enter their names in the visitor's book.
- Access to the housing only in protective clothing and overshoes for visitors, and in farm clothing for staff members. Disinfect hands. New overshoes or housing shoes are to be put on before entering the housing.
- The anteroom is to be separated into a black and white area. Wet cleaning options and a sink with soap and clean or disposable hand towels must be made available.

Flow chart for access to the farm site:



3 HYGIENE

- Use of machines, equipment and tools in the housing only after thorough cleaning and disinfection to prevent direct cross-contamination between the houses.
- Planning for adequate vacant periods between the individual cycles.
- Procure hygienically flawless raw materials (feed, litter, materials to occupy the birds, etc.).
- Systematic beetle and pest rodent control.
- Securing of the barn and storage for litter to prevent wild birds from entering.
- No pets allowed in the turkey housing.
- Immediate removal of dead birds from the housing, if possible, not through anteroom.

Clean disposal of carcasses directly from the housing prevents the spread of pathogens.

Vent stacks secured against birds.

- Removal of carcasses as far away as possible from the housing to the boundary of the site, cool carcasses.
- Disposal vehicles must not enter the immediate vicinity of the housing.
- Ensure harmless disposal of waste.

NOTE:

Strict separation of the black (external) and white (housing) areas.

ATTENTION:

A clean housing environment makes it easier to work hygienically.

3.3 CLEANING AND DISINFECTION

- After removing the litter, the next step is dry cleaning of the house (floor, ceiling, walls must be brushed clean). A pressure washer is then used for wet cleaning. The anterooms and forecourts, as well as the outer shell of the housing and the ventilation shafts, must not be overlooked.
- Tools, dividing grilles and materials to occupy the birds must also be cleaned thoroughly.
- In cases of beetle infestations, initiate counter-measures immediately after emptying the housing.
- Thorough cleaning of the feeding lines and drinkers, as well as the ventilation systems and heat sources. Use of fat-dissolving cleaners.
- Remove all dirt residues.

NOTE:

Dirt cannot be disinfected.

- Insofar as is possible, only use disinfectants that are listed in the Disinfectant List of the German Veterinary Society (DVG) or have the German Agricultural Society (DLG) quality label.
- Observe the suitability, concentration and minimum contact time of the disinfectant.

NOTE:

Disinfectants should be as fast-acting as possible, their effectiveness must not decrease during storage, and they must be as non-toxic or harmless as possible.
Use biocides with care.

- Observe the active ingredient in the disinfectant and its spectrum of activity.
- Use disinfectants with organic acid active ingredients at low temperatures (the general aim should be to disinfect the housing at a minimum temperature of approx. 15°C, the turkey house should be heated to this temperature, if necessary).

ATTENTION:

Avoid wet areas and large puddles of water in the housing.

ATTENTION:

Disinfectants can become diluted in the excess water and lose their potency.

- Use specific products against Coccidia oocysts, beetles, mites, etc. (special products are necessary as the majority of disinfectants are ineffective against these).

ATTENTION:

Insecticides cannot be mixed with disinfectants.

- After using detergents, rinse thoroughly as they can neutralise the effect of disinfectants.
- Before restocking: thoroughly rinse the drinker system, remove residues.
- Completely dry and ventilate the house.
- Lime whitewashing of the lower areas of the walls and potentially also the floor can be used as an additional measure for disinfection.

ATTENTION:

Plan vacant periods to comply with the "biological resting phases".

Provision of working instructions containing all service phase and housing installation processes, that are comprehensible to all members of staff, is useful.

3.4 LITTER HYGIENE

- Litter must be of the highest quality. Avoid dusty, mouldy or damp material (fungal spores).
- Stored litter must be protected against the weather, birds and pest rodents. Covering with a non-woven material has proved ineffective.
- Insofar as is possible, litter stored in the housing must be kept in an area that is inaccessible to the animals.
- If possible, only use litter machines inside the housing. Systematic cleaning and disinfection is required before use in the housing in the event of contact with the black area.

3.5 FEED HYGIENE

- Inspect the interior of the silo before the first delivery of feed. Remove crusts and residues of feed and mould growth from the silo, as well as from the conveyor and weighing systems.
- Regular silo cleaning during the service period (min. 1x annually. Important: ensure the silo is completely dry before use).
- Avoid long storage times of excess feed reserves in the silo. High temperatures encourage the proliferation of micro-organisms and feed spoilage.
- Ideally install a second feed silo. This will make the feeding system more flexible and provides the option of completely emptying the individual silos at regular intervals (if necessary, destroy feed residues).
- A ventilation valve ensures that moisture can escape from the silo.
- Feed lorry drivers are prohibited from entering the housing.
- Systematically clean the silo surroundings to avoid attracting pest rodents and wild birds.

Feed residues under the silo attract pest rodents.

- Regularly allow the feeders to be eaten empty, without allowing the birds to go hungry for any longer than one hour. Avoid excessive quantities of feed in the feeders. If necessary, dispose of excess feed fines.
- When the farm's own grain is used as additional feed, ensure only hygienically safe components are used (e.g. avoid mycotoxins) and that the grain is stored properly. Note feed requirements when participating in quality assurance systems (e.g. QA).

AIM:

Among other things, salmonella-free production and animal health.

3.6 WATER HYGIENE

Drinking water hygiene is extremely important as pathogens can enter the digestive system directly via the water. The administration of supplements via the water system can cause contamination of the lines with bacteria and mould. Residues can be used as food by the micro-organisms, leading to their proliferation and the formation of a biofilm in the lines. The animals are not only reluctant to drink contaminated water, but it also represents a corresponding source of infection.

As a consequence, attention to the cleanliness of the drinker system is crucial during maintenance, but also when the system is running. A three-step cleaning system is recommended during maintenance:

1. CLEANING:	Use suitable detergents that fully remove the biofilm (use both acidic and alkaline detergents, e.g. milking machine cleaner, one after the other in accordance with the instructions, e.g. up to 3 % solution, leave each to act for 12 - 24 hours).
2. DISINFECTING:	Fill the system with disinfectants, e.g. stabilised hydrogen peroxide to kill algae, bacteria, viruses and fungi. Use at 1 - 3 % in the empty housing and leave to act for 24 hours.
3. FLUSHING:	Flush the water lines and drinker systems thoroughly with fresh water before housing new poults. Residues can endanger the health of the poults.

AIM:

Using dyed disinfectants makes checks on adequate concentration easier.

The use of caustic solutions can be dispensed with during maintenance if water hygiene concepts are used to prevent the formation of biofilms while the system is running (on condition that regular checks on effectiveness are carried out). It is worthwhile to keep the pipes filled with disinfectant when the housing is being cleaned to avoid recontamination.

3 HYGIENE

IMPORTANT:

Check the water system regularly for deposits and cleanliness. This includes the secondary lines, branches, valves, filter systems, etc.
Replacement of the entire system is recommended if the effectiveness of the cleaning procedure can no longer be guaranteed.

NOTE:

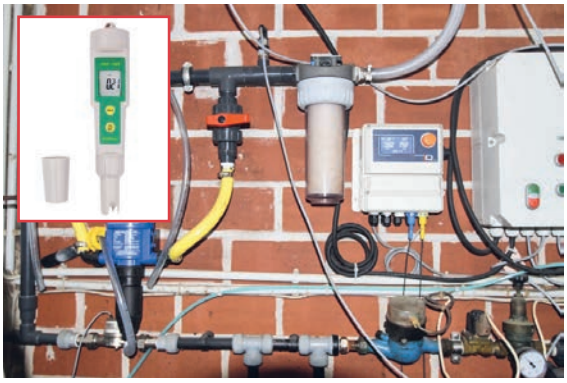
Ensure short pathways for the water and avoid dead ends during installation in the housing. Do not allow lines to sag.

While the system is running:

- Wash the drinkers at regular intervals.
- Flush the water systems at regular intervals, particularly at low flow rates and high temperatures (cool water harbours less risk of microbial growth).
- Use suitable and approved cleaning systems, such as the ORP system or acids or disinfectants (active ingredient in the pentapotassium sulphate group).
- When using farm well water, regularly monitor the drinking water quality (at least 1x per year).

3.6.1 MONITORING WATER HYGIENE BASED ON REDOX POTENTIAL (ORP SYSTEM)

- A hygiene concept that is based on measurements is created by using chlorine and acids in the water. Correct use of the chemicals is required to avoid the production of chlorine gas. Determining the redox potential provides information on the quality of water treatment.
- The value is given using the unit millivolt (mV). The higher the redox potential, the lower the residual contents of disinfectant, and the better the performance of the treatment. Acidic conditions and a constant water temperature safeguard the effectiveness of the redox system.



Meters that are either used manually or permanently installed in the housing have proven effective for determining the parameters.
A value of over 650 mV is regarded as the optimum redox potential as this guarantees pathogenic microbes are killed in approx. 30 seconds.
The table below gives guideline values:

Redox potential (mV)	Killing time	Killing time
	E. coli	Pseudomonas aeruginosa
400 - 500	167 min	211 min
500 - 550	6 min	8 min
550 - 600	100 s	170 s
600 - 650	30 s	40 s
650 - 700	20 s	30 s
700 - 750	10 s	20 s
750 - 800	5 s	10 s

3.6.2 USE OF ACIDS

The use of acids has proven effective in safeguarding sustained high-quality drinking water. A pH of 5.5 to 6.5 is ideal for constant use. This should be reduced to 4.0 to 4.5 in the event of digestive system disorders. However, this programme must be interrupted for approx. 1 day during vaccinations and treatment with antibiotics. Furthermore, acid-resistant water lines are essential.

NOTE:

The greater the care taken with water hygiene, the better the conditions for healthy birds.

4 FATTENING SYSTEMS

The following information pertains to the rearing of heavy turkey strains. The following fattening periods are generally used in heavy strains:

Male birds:	19 to 22 weeks	approx. 19.0 – 23.5 kg
Female birds:	15 to 17 weeks	approx. 9.5 – 12.0 kg

There are different fattening systems:

4.1 ALL IN-ALL OUT CYCLE

Male and female birds are housed together as day-old poults or as young turkeys (aged about 4 to 5 weeks). The female birds are slaughtered at the age of 15 to 16 weeks and the males are given the entire housing area until the end of the fattening period.
The entire facility is cleaned and disinfected after the male birds are removed at the age of 19 to 21 weeks.

EXAMPLE OF A 23-WEEK CYCLE
(All in-all out method)

1,900 m^2 housing area

410 m^2 Female birds

Housing:
2,100 female poults
→ approx. 5.0 female birds/m^2

1,490 m^2 Male birds

Housing:
5,500 male poults
→ approx. 3.6 male birds/m^2

from week 16
→ approx. 2.8 male birds/m^2

Advantage: The chain of infection is interrupted.

Disadvantage: Only 2.2 to 2.4 cycles per year.

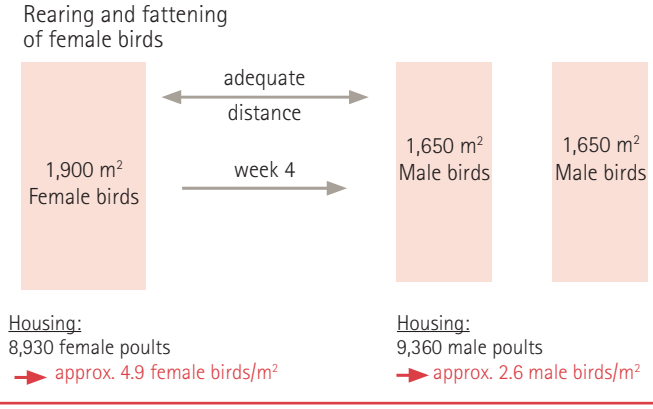
NOTE:

The stocking density is calculated from the number of birds at the time of slaughter.

4.2 18-/19-WEEK CYCLE

The male and female birds are initially also reared together here as day-old poults. However, rearing takes place in special housing which is subsequently used to house the female turkeys. After 4 to 5 weeks, the male birds are therefore moved to one or more houses for final fattening. The female birds remain in the rearing house for further fattening and are then slaughtered at the age of 15 to17 weeks, such that this house can be used to rear poults again after cleaning and disinfection in week 18/19. The male birds are removed from the housing at the age of 19 to 22 weeks. After two weeks, the male house(s) is/are prepared again and made ready to receive the young turkeys from the rearing house.

EXAMPLE OF AN 18-/19-WEEK CYCLE



Advantage: 2.7 – 2.9 cycles per year and therefore greater utilisation of the capacity of the housing complex.
Disadvantage: 2 age batches on one farm, if there is insufficient distance between the rearing and fattening areas.

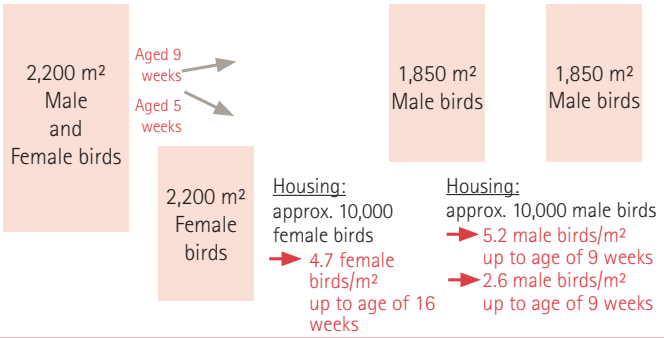
4.3 13-WEEK CYCLE

The rearing of male and female birds takes place in the same house. The female birds are moved to a separate fattening house after 5 weeks and the male birds are moved to a separate fattening house at the age of 9 weeks. The rearing area is only restocked after 13 weeks.

Advantage: Further rise in production by up to 4 cycles per year. Biological resting phase of up to 4 weeks.
Disadvantage: 2 age batches on one farm, if there is insufficient distance between the rearing and fattening areas.

EXAMPLE OF A 13-WEEK CYCLE

50 % male birds,
50 % female birds



4.4 OTHER FATTENING CYCLES AND PROCUREMENT OF YOUNG TURKEYS

Depending on the respective spatial conditions on the individual fattening farms, various different modified forms of the basic systems are found in practice, even through to the 6-week cycle and, thus, also other housing cycles.

When farms specialise, rearing is conducted in different farms and young turkeys are procured. The poults (generally male birds) are reared up to an age of 4 - 5 weeks on an external rearing farm. The young birds are then rehoused on the fattening farm, ideally between days 32 and 35.
The farms accepting the animals generally work in cycles of between 16 and 19 weeks.

4.5 STOCKING DENSITY IN DIFFERENT PRODUCTION SYSTEMS

- Age, type and sex of the animals, as well as the extent of other environmental factors (particularly ventilation conditions and litter management) are closely associated with the setting of stocking density.
- Based on the number of animals per m², the following figures can be used for orientation (relating to the growing performance of BUT 6 in husbandry pursuant to the German federal benchmark figures) when planning of the different rearing and fattening phases:

Rearing up to 5 weeks old (male and female birds)	8 - 10 animals m^2
Fattening of female birds up to 16 weeks old (max. stocking density 52 kg/m^2)	4.7 animals/m^2
Fattening of male birds a) up to 21 weeks old (max. stocking density 58 kg/m^2)	2.6 animals/m^2
b) up to 10 weeks old using the 13-week cycle	5.2 animals/m^2
b) up to 16 weeks old using the 23-week cycle	3.6 animals/m^2

Data refer to animal numbers at the time of removal from the turkey house.

NOTE:

Stocking densities in the extra care-area must not exceed 45 kg/m^2.

4.5.1 HEALTH-MONITORING PROGRAMME

Within the scope of the German federal benchmark figures for a voluntary agreement on the husbandry of turkeys, the turkey farmer is under the obligation to participate in the health-monitoring programme. Farmers must independently assess the condition of their flocks with regard to indicators on animal health, mortality and development as part of their obligation for self-monitoring (§ 11, paragraph 8, Animal Welfare Act). Further data from the slaughterhouse are checked, such as footpad health, mortality rates, and physical condition of the animal or animals discarded by the slaughterhouse.

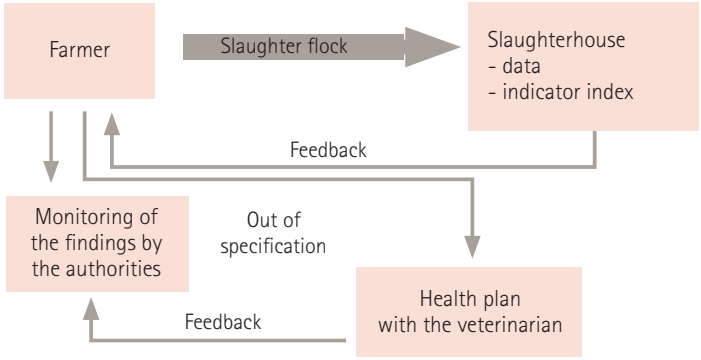


Fig.: Flow of information on the fattening flock within the scope of the health monitoring programme

When participating in the health monitoring programme, the maximum stocking density of 52 kg live weight per m² of usable housing area applies to female birds and up to 58 kg for male birds at the end of the fattening period.

NOTE:

The stocking density is calculated from the number of animals at the time of slaughter.

4.5.2 ANIMAL WELFARE INITIATIVE

The Animal Welfare Initiative (ITW) is a coalition between agriculture, the meat industry and the food retail industry. The following animal welfare criteria must be adhered to:

- Health monitoring programme based on German federal benchmark figures
- Monitoring of antibiotics
- Training for the livestock farmer
- Regular checks on climate in housing
- Regular checks on drinking water
- Additional materials to occupy the birds
- Reduced stocking density (male birds 53 kg/m² and female birds 48 kg/m²) at the end of the fattening period

To compensate for the additional work, the livestock farmer is given an animal welfare payment from a fund that is paid into by the food retail industry, in addition to the proceeds from the slaughter.

4.5.3 OTHER FORMS OF HUSBANDRY

Animal welfare and organic farming labels issue their own figures for spatial requirements and management measures. These can be accessed on the websites of the relevant associations.

5 REARING AND FATTENING

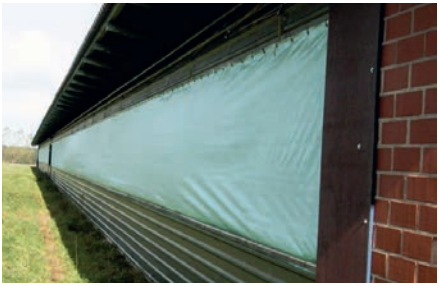
5.1 HOUSING SYSTEMS

Turkey farming mainly differentiates between two types of housing air-conditioning systems:

1. Open housing
2. Closed housing

5.1.1 OPEN HOUSING AND OUTDOOR VERANDA

Open houses have large open side panels which can be closed using adjustable curtains or sandwich flaps, depending on the requirement for ventilation and the temperature. The air warms up in the house and rises due to thermal lift. The exhaust air is discharged into the atmosphere, either through adjustable flaps in the ridge of the roof, with or without electrically driven ventilation, or through lifting roof ridges.



Outdoor areas, called verandas, may extend the area that can be used by the turkeys in some husbandry systems. These should fulfil the following criteria:

- Catslide roof attached to housing
- Recommended eaves height at least 2.50 m
- Polished cement floor
- External cement footings at least 0.40 m
- Fencing with poultry cage basement wire mesh, ideally also with a windbreak screen

Insulation is often dispensed with. The outdoor area has litter, but no food and water.

5.1.2 CLOSED HOUSING

In closed houses, the fresh air is drawn into the room through ventilation valves in the side walls. The negative pressure required for this is usually generated by extractor ventilators installed in the ridge and/or gable of the roof.

5.2 HOUSING CLIMATE AND AIR QUALITY

The housing for the animals must comply with the highest possible standards, especially during rearing, to ensure that the poults are given an optimum and trouble-free start in life. Prerequisite to this is a house that is dry, can be heated, is well-ventilated, but without draughts, and well-insulated, with a cement floor. If the housing is used all year round, then it must have an air-conditioning concept that caters both for cold and very hot weather and is suitable for all animal age groups.

The aim is to avoid a poor climate in the housing at all costs, as animal health will otherwise be compromised.

Poor housing climate

- Moist / wet litter
  - Increase in the ammonia levels in the air in the housing
  - Negative effect on footpad health and the carcass quality
- Respiratory (breathing) problems
- Increase in susceptibility to disease
- Reduction in weight gain
- Non-uniform flock
- Reduced oxygen uptake in the organs
- Increased stress on the cardiovascular system (round-heart disease)

5 REARING AND FATTENING

The housing climate is one of the most important factors in successful turkey rearing.

Why provide ventilation?

- Provision of oxygen for breathing.
- Reduction in harmful gases, such as CO_2, CO or NH_3.
- Removal of excess moisture.
- Removal of excess heat.
- Reduction in the levels of dust particles in the air.

GUIDANCE VALUES FOR AIR QUALITY:	
Carbon dioxide (CO_2)	< 3,000 ppm
Carbon monoxide (CO)	< 10 ppm
Ammonia (NH_3)	< 20 ppm
Relative humidity (rH)	50 - 70 %

- The ventilation system in the turkey house should essentially be designed in such a way that draught-free ventilation is ensured during the rearing period.
- During the fattening phase, a stream of fresh air must be maintained over the floor area so that the air quality required for the well-being of the birds is maintained throughout.

IMPORTANT:

Avoid draughts as a matter of principle.

- Good air quality requires heating and ventilation systems that create uniform climate conditions throughout the entire housing.
- The ventilation systems that are installed should have a power output that is 20 % higher than required, to ensure that allowances are made for system wear and perfect functioning.

5.2.1 PREPARATION FOR GOOD VENTILATION MANAGEMENT

- Seal cracks and other areas through which air might enter to avoid heat loss and draughts. Particular attention must be paid to doors, inlets, outlets and shutters.
- Check ventilation function between cycles after final disinfection.
- Calibrate all the thermostats to ensure accurate settings.
- Adjust the settings to safeguard minimum ventilation.
- Under conditions of high ventilation, adjust the ventilation thermostats to the target temperature. Ventilators with thermostats should switch on if the temperature rises to 1 °C higher than the target temperature.
- Combine several ventilators to reduce the air stratification and increase heating efficiency. These should be hung at ceiling height at a distance of 15 -18 m from each other.
- Heat as required to reduce the litter moisture due to the increased ventilation.
- Do NOT compromise on air quality if you want to save energy.

IMPORTANT:

- Equip all housing with alarms for monitoring the supply systems (feed, water, ventilation).
- Ensure an emergency power supply is available and check its function at regular intervals. Emergency power generators that start up automatically are ideal.

5.2.2 VENTILATION SYSTEMS AND VENTILATION MANAGEMENT

Ventilation systems are divided into two groups.

5.2.2.1 GRAVITY VENTILATION

The open housing that is widespread across Germany generally consists of gravity-ventilated housing.

The air in the housing that has been heated up by the turkeys rises in accordance with the laws of physics and escapes through the, preferably controllable, air vents or an open roof ridge. This "chimney effect" draws fresh air into the housing from outside through the long open sides (adjustable opening with shutters or flaps).
When ambient temperature is high, i.e. in the summer, heat must be extracted from the turkey area as it will otherwise build up and cause heat stress in the animals. To ensure the turkeys do not suffer from heat stress, drive fans should be used to compensate for the lack of thermal lift and to prevent heat build-up. Unused cooler air is a source of oxygen for the animals.

HINT

When ambient temperature is low outside, drive fans running at low speeds can also be used to circulate the warm air that has collected under the ceiling.

5.2.2.2 FORCED VENTILATION

This type of ventilation is divided into negative pressure, constant pressure and positive pressure ventilation.

Turkey housing is almost exclusively ventilated using negative pressure ventilation and the other two types of ventilation will therefore not be entered into here.

The exhaust air is extracted by negative pressure ventilation, with fresh air being drawn into the housing through the vents (valves, flaps, etc.) as a consequence of the negative pressure.

The level of air ventilation can be controlled with the exhaust air ventilator. With reference to the age of the animals and their weights, the settings for ventilation capacity are dependent on factors including:

- housing volume
- the quantity of harmful gases requiring extraction (e.g. CO, CO2, NH3)
- the amount of humidity requiring extraction

The speed at which the fresh air is drawn in and the negative pressure in the housing can also be controlled through the inlet area of the air valves. The smaller the ventilation openings and the higher the exhaust air capacity, the faster air will enter into the housing.

Furthermore, there is the option of interrupting continuous ventilation with an interval switch. This is helpful in cases of low ventilation requirements, where intermixing of the used air in the housing with the fresh air is often inadequate. The housing climate computer controls interval ventilation over periods of a few minutes with high effective pressure, depending on the desired air quality or housing temperature. This allows savings to be made in relation to ventilation and heat energy.

Negative pressure is measured in pascals. The setting for the negative pressure (pascal value) is dependent on factors including:

- the cross-section of the housing
- the outdoor temperature
- the efficiency of the ventilation openings.

Drive fans can also provide for good, more even mixing of the air and thus reduce the extraction rate for exhaust air in housing with forced ventilation.

5.2.2.3 VENTILATION PRINCIPLES

The minimum ventilation rate is the lowest air volume required to ensure an adequate air supply for the animals during the rearing and fattening phases. Harmful gases and moisture should also be reliably extracted at the same time.
Therefore always ensure minimum air exchange.

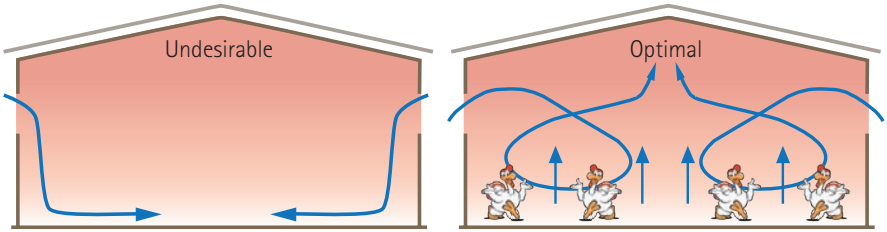
NOTE

Warm air absorbs more moisture than cold air.

Cold fresh air should not be directed at the animal. The incoming air must therefore be subject to targeted controls. Warm air in the housing should be mixed with fresh air and only then slowly reach the turkey.

NOTE

If the area of the incoming air vent is too big when outdoor temperatures are low, then the cold air will flow directly down to the animals after only a few metres.



The animals must be provided with cooling through summer ventilation, especially on hot days and when humidity is high. Enthalpy is the guidance value here.
The enthalpy indicates the total energy content in the air, depending on the temperature and humidity, and serves as an indicator of the thermal load in poultry.

NOTE

The critical upper enthalpy limit is 67 kJ/kg dry air. (Information from meteorological service).

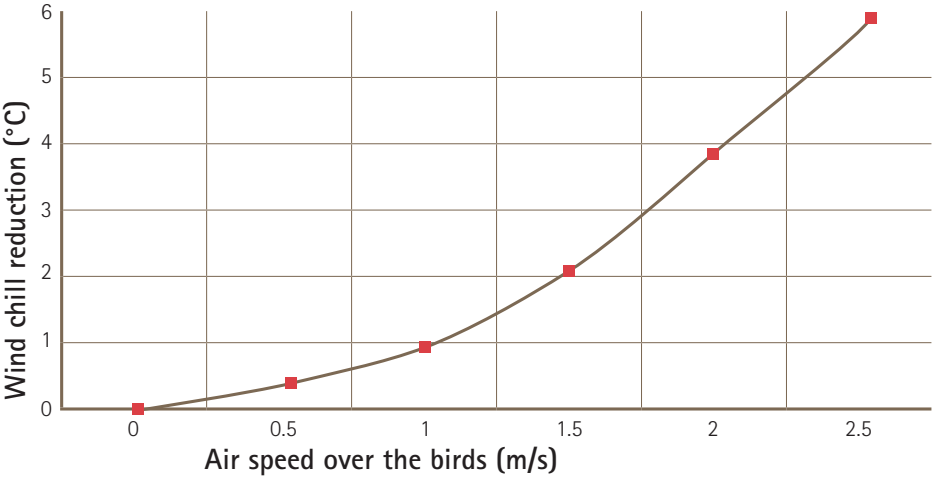
Poultry experience particular stress at high enthalpy values as a result of their poor ability to transpire. In extreme situations where insufficient heat is dissipated from the animal, this situation can result in the build-up of heat and in fatal heat stroke after a very short time.
Even at only slightly elevated temperatures, turkeys respond with beak breathing (panting, like in dogs). Insofar as is possible, increase the air exchange and reduce the temperature, if necessary.

HINT

Use spray cooling systems carefully but sensibly, not only in cases of extreme heat, but also when temperatures are only slightly elevated.

Technical conditions:

- For summer ventilation at enthalpy values around 67 kJ/kg dry air, both gravity ventilation and negative pressure systems must be designed for corresponding ventilation capacities.
- Systems using the "wind-chill effect" are ideal for summer ventilation and ensure partial or full tunnel ventilation, with simultaneous optimum room through-flow.
- Additional ventilation measures (as a rule, drive fans with an approximate capacity of 40,000 m³/h at 1.1 KW) may be necessary.
- The maximum reach of the respective drive fan must also be taken into consideration here.
- Drive fans are to be installed in the housing such that good room through-flow is ensured. They should be hung from the ceiling at a height of 1.5 m and at an angle of 80° to the floor. The distance between the drive fans should be based on the model and reach, e.g. distances of 25 - 35 m are recommended for a capacity of 40,000 m³.



- Spray cooling systems are recommended for lowering the interior temperature of the housing, especially in extreme weather, and for consolidating dust.
- Cooling pads can contribute towards cooling in hot, dry climate zones.

5.2.3 ANIMAL MANAGEMENT DURING HIGH TEMPERATURES

- When high temperatures are expected, the spray cooling system can be switched on early in the day to reduce the effects of an extreme heat situation.
- The following is important:
  - > Daily use in short bursts, also before the hot period, so the animals are used to it and the lines do not become contaminated with microbes.
  - > Start the cooling programme at temperatures no higher than 25°C to avoid the housing heating up.
  - > Continue ventilating to extract moisture from the housing.
  - > Do not open the shutters too much to ensure that the cooling effect is taking place inside the housing and not outside it.
  - > Keep doors to housing closed on the sunny side to avoid heat spots.
- Withholding feed between the morning and evening may help to reduce the animals' metabolism and the physical stress.
- Corners in the housing with less air flow should be cordoned off.
- Frequent checks on the animals and movement of the flocks is just as essential as fresh litter and an adequate supply of vitamin C or electrolytes.

5.3 LITTER MANAGEMENT

The housing climate, and therefore the health of the birds, is significantly influenced by the properties and handling of the litter. The aim is to provide a dry, dust-free environment at all times, to reduce breeding grounds for bacteria. This can counteract footpad and skin changes, as well as respiratory complaints. Cellulose materials, such as straw, wood shavings or grain husks in their original or processed form, are in standard use as litter for turkeys. The dry surface of the litter also provides materials to occupy the birds, in addition to insulation against the cold floor and ensuring the uptake of moisture.

The following criteria should be considered when selecting the material:

- Select an absorbent base material; a reduction in particle size increases absorbency.
- Keep the proportion of dust as low as possible, even after possible disintegration of the compressed material.
- Once again, hygiene is the top priority here: the material must be free of dirt, harmful substances, pathogens or mould and fungi.

Handling of the litter requires special attention.

- Where underfloor heating is used, the first layer of litter is spread more thinly (approx. 3 cm) than when the heat is only provided from above (8 - 10 cm), so that the heat reaches the poults from below. This also means that the litter material can dry more easily at the start.
- Turning the litter is recommended, so long as dry, clean material can be brought to the top from below.

- The addition of sufficient quantities of new litter at regular intervals is recommended later on to maintain a dry surface.
- Very wet and compacted litter, e.g. after a drinker has overflowed, should be removed from the house and replaced with dry material.
- Pelleted litter materials are initially distributed more thinly 2 - 4 cm, 8 - 15 kg per m²). These require a slightly raised heat input (approx. 1 - 1.5 °C heat loss through the material). The litter mat increases to up to 10 - 14 cm in depth after the pellets have disintegrated and moisture has been absorbed.
- Litter for topping up should be stored in the house, if possible, but out of the reach of the animals.

NOTE:

A generous top layer of fresh litter material is always recommended in cases of illness.

5.4 FEEDER AND DRINKER REQUIREMENTS

- The top priority in both rearing and fattening is the design of the facility: Create easy access to locations with feed and water.
- When distributing the feeding and drinking facilities in the housing, ensure that the animals are no more than 6 m away from a feeding point, wherever they are.
- In turn, the individual drinkers should be no further away than 4 m from the nearest feeding point.

Round feeders	**Live weight per feeder**
Rearing trough (approx. 30 - 50 cm Ø)	250 kg
Fattening trough (approx. 30 - 50 cm Ø)	1,000 kg
Individual feeder (approx. 60 cm Ø)	1,500 kg
Round drinker (approx. 25 – 50 cm Ø)	**Live weight per drinker**
Rearing	350 kg
Fattening	2,000 kg
Nipple/cup drinkers	**Live weight per drinker**
Rearing	150 kg
Fattening	500 kg

5 REARING AND FATTENING

It is practical to use the following figures when planning the number of birds per feeder or drinker:

Fattening turkeys - Standard feeder:	approx. 50 - 80 animals/feeder
Fattening turkeys - Standard round drinker:	approx. 80 - 100 animals/drinker

5.5 PREPARATION FOR REARING

There are basically two different rearing systems:

1. Rearing in poult rings
2. Rearing without rings and with heat

5.5.1 REARING IN POULT RINGS

- During the first few days, the poults are reared in special poult rings with a point heat source, such as a gas heat lamp.
- To avoid initial losses, it is imperative that the birds find their housing and rings well prepared when they arrive. Any retrospective work must be avoided at all costs.
- For example, the floor of the poult ring is covered with a layer of softwood shavings that is 7- 10 cm deep (about 3 cm with floor heating) or a layer of broken up litter pellets (granulate) that is 2 - 4 cm deep. The surface should be flat and compact, to reduce the risk of flipovers.
- After litter compaction and housing, the drinker heights must be re-adjusted to the size of the birds.

NOTE:

The height of the drinkers must always be such that all animals can drink from them.

- Depending on the housing conditions, the poults are kept in the ring for 3 - 6 days.

Extra care-area for poults:
Separation of weak poults after they have been watered, e.g. in a separate ring.

- In this case: This area is preferentially lined with wood wool or rubber mats so the poults have a better grip.
- Easy access to feed and water must be guaranteed.

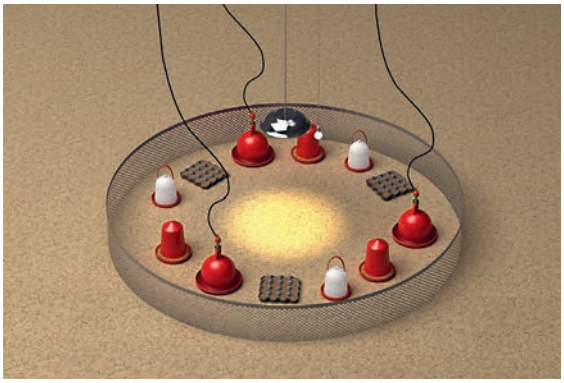


Fig. Poult ring design (example)

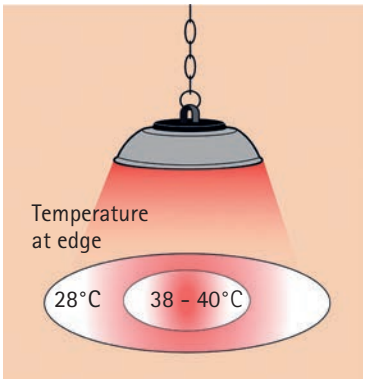


Fig. Rearing heat lamp temperature

- Diameter: 3.50 – 4.50 m for 240 – 400 poults.
- Ring material: Wire mesh or material with similar perforations for optimum air exchange (approx. 30 – 50 cm high).
- Gas heat lamp: A heat output of 3.0 - 5.5 kW for natural gas and propane, depending on the size of the ring and number of poults. If possible, this should be controllable for adjustment to the external climatic conditions. The heat lamp should be hung at a height of approx. 70 - 90 cm, depending on the type of heat lamp and season (lower in summer than in winter).
- Temperatures: In the birds' resting area: 36 - 37 °C. Room temperature (at edge of ring): 23 - 26 °C.

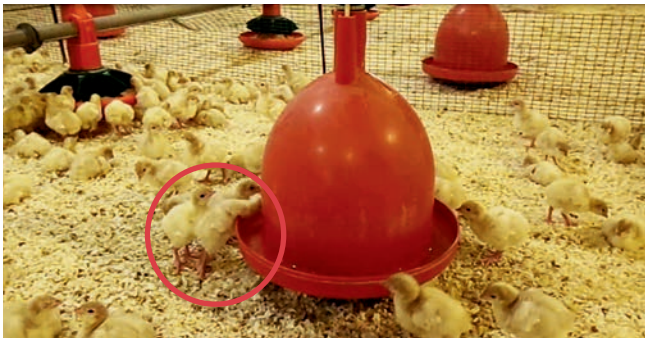
- Drinkers: Different drinker systems are possible, depending on the number of poults per ring, e.g. 2 - 4 automated round drinkers or combinations of round, ancillary and line troughs.
- Feeders: One height-adjustable round feeder (called Beckees) for 80 - 100 poults and also 4 egg trays or "fruit bowls" (plastic packaging material) during the first few days.

The drinkers are filled to 90 % at the start.

- Lighting: Good housing illumination and one additional dimmable light source per ring as a nesting light, so that a light intensity guidance value of approx. 80 lux is reached at the level of the poults, depending on litter material and colour.

IMPORTANT:

Correct height adjustment and sufficient water in the drinker (3 days, 90 % filled).



Drinker too high for poults

Correct temperature

Even distribution of poults

Level of noise indicates satisfaction

Draught

Poults move to avoid the draught

Poults loud, complaining

Temperature too low

Poults cluster under heat lamp

Poults loud, complaining

Temperature too high

Poults stay away from heat lamp

Poults quiet

Poults panting, head and wings drooping

5.5.2 REARING WITHOUT RINGS

Ring-free rearing without spot heat sources is initially characterised by a constant room temperature of 36 - 37 °C, with the poults reared together in large groups of 2,000 – 10,000. A working temperature of 24 - 32°C is possible with additional spot heating. The most important condition for ring-free rearing is housing that is well insulated, with a well functioning ventilation and air conditioning concept.

Compartments:	Separation of the large groups with corrugated cardboard, mounted on the floor and stabilised using a support approx. every 2 - 3 m.
Heat sources:	Ideally, warm water heating with convectors, ceiling heat lamp panels and floor heating, optionally with gas guns.
Drinkers:	Various drinker systems and combinations are possible: Line troughs, round drinkers and ancillary bowls. It is important that a uniform water supply is available over the entire area. **Important:** Pay particular attention to water hygiene at high temperatures.
Feeders:	One height-adjustable round feeder (called Beckees) for 80 - 100 poults and also 4 egg trays or "fruit bowls" (plastic packaging material) during the first few days.
Lighting:	Good housing illumination so that a total light intensity of approx. 80 lux is reached.

5 REARING AND FATTENING

Temperatures:

Age	Under the rearing heat lamp [°C]	Ambient temperature [°C]	Rearing without rings [°C]
Day 1	40		36 - 37
Day 2	40		35 - 36
Day 3	39 - 40		34 - 35
Days 4 - 7	38 - 40		Reduce temperature by 1°C each day
Week 2		27 - 28	27 - 28
Week 3		25 - 26	25 - 26
Week 4		23 - 24	23 - 24
Week 5		21 - 22	21 - 22
Week 6		20 - 21	20 - 21
Week 7		19 - 20	19 - 20
Week 8		18 - 19	18 - 19
Week 9		17 - 18	17 - 18
Week 10 until housing is emptied		16 - 17	16 - 17

The temperatures specified in the recommendation to ensure functioning and age-appropriate ventilation may need to be adjusted under extreme weather conditions (e.g. outside temperatures above the desired inside temperature or poult rearing in high summer).

ATTENTION:

- High concentrations of harmful gases develop when heating systems with naked flames are used. Ventilation of the housing is then required from the first day onwards.
- Poults and heat lamps compete for oxygen.
- Severe panting in the poults may indicate that the temperatures are too high.
- Poults clustering together indicates cold and/or draughts. Danger of suffocation.

Example: Difference between floor and ceiling temperature as warm air rises.

5.6 HOUSING AND FIRST WEEK

• Depending on the weather, heat the house 2 - 4 days before housing the poults. Additional temperature monitoring of the litter using hand-held infrared thermometers safeguards the correct procedure. The temperature of the floor plate should be no lower than 27°C for a thin layer of litter.

BE MINDFUL:

Cold floors draw the body heat out of the poults.

- Feed and water should not be provided too long before housing the poults: high temperatures can compromise the feed and water quality. Therefore, flush the water system, empty the poult drinkers and fill them with fresh water before housing the poults.
- Place the poult boxes in front of the rings or compartments that have been prepared.

ATTENTION:

Do not place the boxes on the cold floor, and do not stack them or place them too close together for lengthy periods (risk of suffocation).

- Vaccination against TRT or other pathogens can be administered in the box if this has not already been carried out by the hatchery.
- The lighting is dimmed during housing so the poults can slowly become accustomed to the housing environment.
- Place the poult calmly but quickly into the ring or compartment. Never throw the animals.
- Do not make noise or undertake retrospective construction and maintenance work: this will disturb the poults and they will press themselves against the edge of the ring or compartment boundaries.
- Carry out a quick inspection, after which the poults should be left alone for several hours to get accustomed to their new environment. This minimises imprinting on humans.
- After this, some adjustments may be required to the ventilation, heat lamps, feeders or drinkers.
- Regularly refill the feeders with fresh feed to encourage the poults to eat.
- Clean the drinkers each day and flush the entire water system several times a day.

NOTE:

Poults can only eat if they drink.

NOTE:

The water can get contaminated with microbes very quickly at high temperatures.

- Fines and clumpy, damp and excrement-contaminated feed residues must be removed from the feeders and the egg trays/fruit bowls must be replaced as necessary.
- Adjust the heat lamp temperature or room temperature to the needs of the poults. The distribution of the animals shows whether they require more heat.
- The litter compacts after the poults have been introduced, so regularly check and adjust the drinker heights as required
- The temperature can be reduced after Day 3.
- The egg trays/fruit bowls can be gradually removed after Day 4.
- The poults are removed from the rings by Day 5, with their condition and the weather conditions dictating when this occurs (the same applies to moving them to the fattening house at the age of 4 - 5 weeks).
- Avoid all forms of stress on the poults.

ATTENTION:

Make any changes as fluently as possible.

To create a housing climate appropriate to the needs of the birds in the male bird house and after re-housing for fattening, use of heat lamps is also recommended in such housing to improve the air conditioning (i.e. heat with concurrent ventilation). Additional ventilation systems must be provided during heat and in wind-still conditions to ensure sufficient air movement around the birds.

ATTENTION:

Keep the temperature differences as low as possible during transfer from the rearing to fattening houses.

5.7 LIGHTING

The photoperiod and light intensity in open houses are dependent on the climatic conditions and season.
The lighting regime given below must therefore only be taken as a general guideline. Lighting in poult rearing housing is essentially dictated by the type of housing (open or closed) and the lighting system, as well as the colour of the litter.
The lighting regime must be individually tailored to the behaviour and activity of the poults, especially during the rearing phase and, above all, during the first few days.

Use of intermittent lighting regimes (e.g. alternating 4 hours light, 2 hours dark) helps to regulate the resting and feeding times of the poults and to thereby manage the flocks.
Smooth transitions between light and dark phases reduce stress in the poults.

ADVANTAGE: The poults rest or sleep at the same time.
The behaviour of the poults is synchronised.

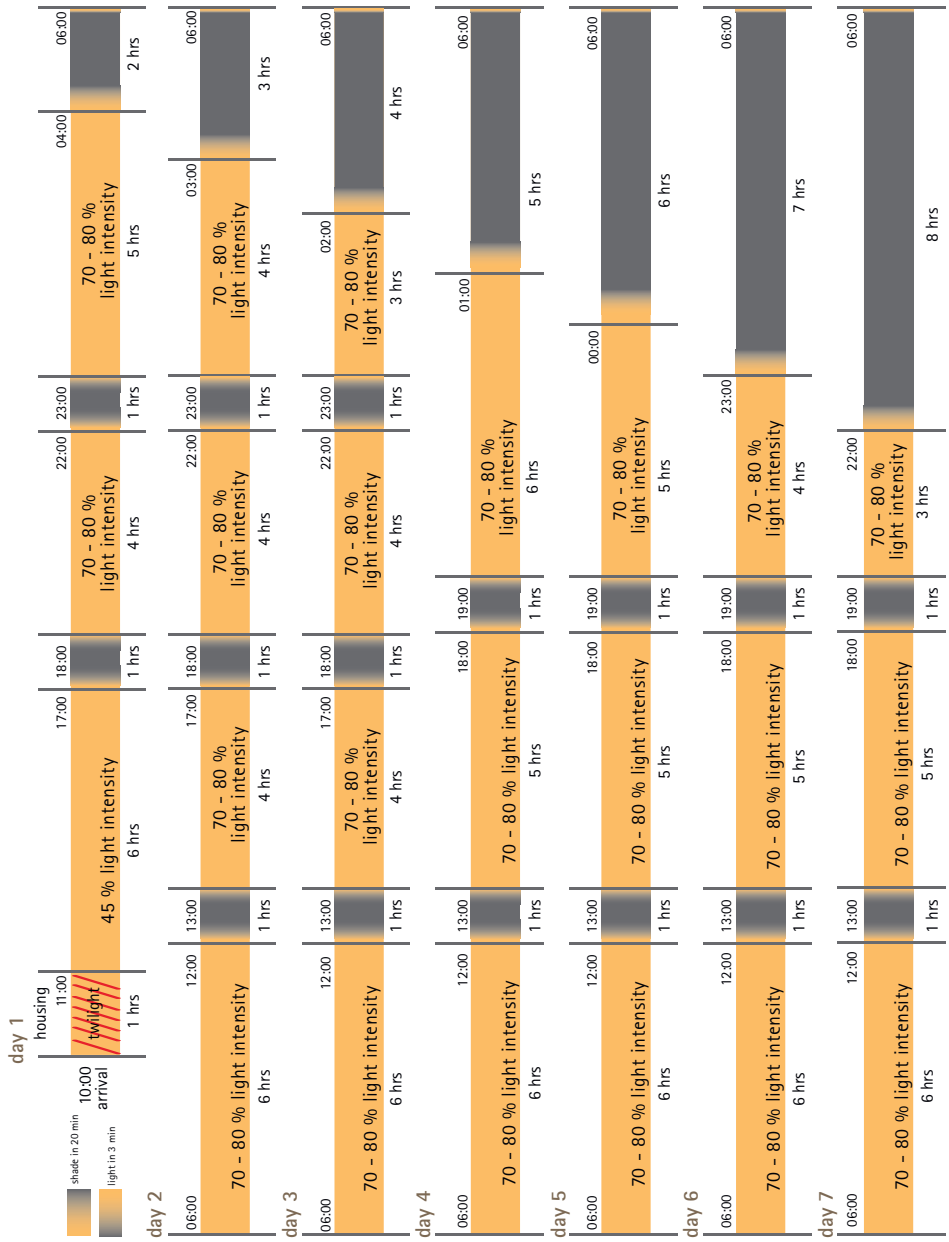
NOTE:

- Direct sunlight should be avoided in the animal area, whenever possible.
- Artificial lighting should be dimmable, so it is possible to respond to the behaviour of the poults.
- Artificial lighting must not flicker. Frequencies of at least 160 Hz are recommended.

- Provide successional dark resting phases for the turkeys. An emergency light with an intensity of 0.5 lux is permissible.
- Good lighting without strong shadows within the poult rings and compartments is recommended during the first days of life.
- Structuring of the lighting in the housing to create lighter and darker zones is recommended later on. This facilitates the creation of resting and activity zones within the housing.
- Light intensity: a minimum of 20 lux pursuant to the German federal benchmark figures on rearing turkeys.
- Temporary darkening or a reduction in the light intensity to below 20 lux is tolerated if feather pecking or cannibalism occurs.
- Consultation with the veterinarian and documentation are required in such cases.
- Additional measures (e.g. changes to the materials for occupying the birds) are recommended.
- Increase the light intensity in small steps again once the event has ceased.

5 REARING AND FATTENING

EXAMPLE OF A LIGHTING REGIME



5.8 MATERIALS FOR ENGAGEMENT

- The turkeys must constantly be offered suitable materials to occupy them. This also includes newly introduced litter material as well as worked litter.
- In addition, manipulable material must be made available, e.g. hay racks, hay baskets, straw bales, peck stones, washed old clothing.
- Further materials to occupy the birds should be made available if feather pecking and cannibalism occur.
- Timely replacement with different types of materials is recommended as soon as the animals lose interest, to ensure the materials to occupy the turkeys remain attractive to them.

6 FLOCK MANAGEMENT AND ANIMAL WELFARE

NOTE:

All turkey rearing farmers are under the obligation to collect and assess suitable animal-related indicators within the scope of self-monitoring pursuant to § 11, paragraph 8 of the Animal Welfare Act.

- "Animal welfare indicators" assessed during rearing, fattening and slaughter can include changes to the foot pads, mortality rates, deaths during transport, numbers of animals discarded.
- In the event of abnormalities, an individual farm health plan must be produced with the veterinarian who is in charge.

The daily flock and facility inspection ensures the farm runs smoothly. At least two inspections should be made per day as this ensures early recognition of anomalies. All observations (especially the consumption of feed and water, as well as temperatures) must also be documented in writing.

The following items serve as a check-list for flock management:

- Bird behaviour (noises, plumage, distribution)
- Litter condition
- Consistency of the faeces
- Air quality in the animal area
- Dust production
- Temperature
- Feed consumption, water consumption
- Feed level and system height
- Feed quality, pellet quality
- Drinker height and filling level
- Drinker cleanliness
- Weight increase and uniformity in the flock, documented using scales in the housing or hand-held scales (objective: high uniformity and low coefficient of variation)

6 FLOCK MANAGEMENT AND ANIMAL WELFARE

6.1 VACCINATIONS

Healthy animals form the basis for successful turkey rearing. Farm-specific health care concepts agreed with the veterinarian play a central role here.

The Fowl Pest Regulations legally prescribes vaccination against Newcastle Disease (ND), i.e. pseudo-fowl pest, to be administered by a veterinarian in Germany.
Depending on the regulations in the respective German states, the ND vaccination programme can be carried out according to, for example, the following schedule: age 3, 6, 10, 14, 18 weeks).

Approved vaccine strains are La Sota, Hitchner and Clone 30. The vaccines are generally administered via the drinking water. Spraying or misting is also possible, in consultation with the veterinarian.
Alternatively, the poults can also be given an ND vector vaccine in the hatchery. In such cases, vaccination in the housing no longer required.

NOTE:

- Only vaccinate healthy birds.
- Switch the water hygiene system off in good time. There must be no disinfection solution anywhere in the water lines at the time of vaccination, otherwise the vaccination will not be effective.
- Briefly restrict access to water before vaccination to ensure the birds are thirsty. Administer a water volume that can be drunk by the flock within approx. two hours.

Depending on the respective location and situation of the farm, in addition to the mandatory vaccination, further vaccinations are recommended, for example against TRT (turkey rhinotracheitis: a cold virus affecting turkeys) or HE (haemorrhagic enteritis: an acute intestinal inflammation affecting turkeys).
In addition to the drinking water and/or misting vaccinations, farm-specific vaccinations, administered by injection as disease prophylaxis, have also proven effective. An initial housing-specific vaccination can be administered in the hatchery.
The vaccination programme is adapted to the conditions on a given farm in consultation with the farm veterinarian.

6.2 PREVENTATIVE HEALTHCARE

NOTE:

Scattering a thin layer of rock dust and cellulose products over the feed, as required, has proven effective as an accompanying measure, e.g. when the feed is changed or in stress situations. The targeted addition of acid to the drinking water can also help the digestion and protect against pathogens.
Pre- and probiotic products (e.g. lactic acid bacteria) that are dispersed in the water or using misting are also well suited to promoting healthy gut flora in the turkeys.

6.3 FLOCK OBSERVATION

An important prerequisite for early disease recognition is close observation of the flock.
Through the behaviour of individual birds, an observant farm hand will already recognise a deterioration in the health of the flock 1 - 2 days before the disease emerges, which manifests as:

- Changes in feed and water consumption.
- Need for warmth and non-uniform distribution.
- Crouching in corners and separation from the flock.
- Changes in colour or consistency of the faeces.
- Sudden behavioural changes in the flock.
- Changes in the smell in the house.
- Drawing in of the neck.
- Ruffled plumage.
- Increased beak panting.
- Plaintive cheeping sounds.
- Sounds when breathing.
- Eating litter.
- Pale head colour.

Animals standing around in a lethargic manner are signs of health-related problems.

The precise description of the changes gives the attending veterinarian the first clues for a diagnosis. Laboratory tests confirm the diagnosis and the required therapeutic interventions.

6.4 EXTRA CARE-AREA

NOTE:

Birds that are diseased and/or injured must be separated from the flock as soon as possible. Rapid intervention is of great importance here.

- Feed and water must be particularly easily accessible to all birds in the care area.
- In addition, ensure good availability of litter. The stocking density must not exceed 45 kg/m^2 and the birds in the area must be checked at regular intervals.
- Do not forget materials to occupy the birds.

Treatment with wound spray can promote rapid healing of fresh injuries and prevent the wounds being pecked by other birds in the care area.

6.5 EMERGENCY KILLING

Emergency killing is governed by the Animal Welfare Act, as follows:

- Birds in the care area that do not improve within a reasonable time frame when checked, or are no longer feeding and drinking, are to be killed in accordance with animal welfare law.
- The same applies to turkeys with severe injuries, such as broken legs or serious, deep wounds. There is no prospect of such animals recovering and they are to be killed immediately after discovering such injuries.
- Animals may only be killed by staff with the relevant qualifications.
- Turkeys must be anaesthetised before they are killed. Practical, approved methods of anaesthetisation are a blow to the head with a blunt implement for animals weighing up to 5 kg and a bolt gun must be used for animals that are heavier. The effectiveness of anaesthetisation must be checked first, which manifests in turkeys through uncontrolled beating of the wings and flexion and extension cramping in the legs, among other factors. After this, birds weighing up to 3 kg can be killed by wringing their necks, while the neck must be broken with tongs in heavier turkeys.
- The emergency slaughter of an animal must be documented with the cause.

NOTE:

Birds that will obviously not survive must be anaesthetised and killed in accordance with animal welfare law. This also applies to animals in the care area, if they show no improvement within a reasonable time frame.

6.6 LOADING FOR TRANSPORT

NOTE:

The livestock farmer is responsible for loading the animals.

The farmer has the following obligations:

- When using external staff, checks must be carried out an a signature obtained, confirming that
  - the driver is qualified and
  - all catchers have been trained in the correct handling of turkeys in accordance with animal welfare law.
- to ensure that the transport containers are not overloaded. to ask the lorry driver what the permissible number of animals is per container.
- to check on loading staff hygiene measures and on the loading technology.
- to be present throughout the entire loading process to monitor correct handling pursuant to animal welfare law.

Herding and loading:

- Only load animals that are fit for transport.
- Animals that cannot move independently due to injury or disease are separated and killed by the livestock farmer/farm hand in accordance with animal welfare law.
- Transport staff are not permitted to kill animals.
- The animals are slowly and calmly herded towards the loading equipment in small groups.
- Only optical/acoustic aids (e.g. plastic bags) are permitted for herding.
- Use of canes is prohibited.
- Any actions that are painful, cause suffering or harm to the animals are prohibited.
- The animals must never be kicked, hit or thrown.
- Pulling the neck, head, tail, feet or tips of the feathers is also prohibited.
- Animals that are fit for transport that cannot be herded are loaded into the transport containers using transport grabbers (diagonal fixing and three-point fixing) or other aids (e.g. wheel loader).
- Make sure that the wings and feet are not caught in the doors when closing the transport containers.

ATTENTION:

On hot summer days, loading should be carried out in the cooler hours of the evening or night. The air circulation can be improved for those animals that have already been loaded by setting up fans.

7 FEEDING

The results of our own fattening trials, literature, breeder recommendations and experience in the field form the basis for the recommendations for energy and nutrient supplies for heavy fattening turkeys. These recommendations are therefore designed to promote healthier rearing of the birds, using their genetic potential, while ensuring that the farm is economically viable.

7.1 FEEDING REGIMES

The feeding regimes should not be seen as rigid specifications, either temporally or in terms of content, but rather as "dynamic systems". This means that the nutrient input in a given phase is decided on based on the health and performance status of the turkeys, the weather (e.g. heat), the price situation of the feed components, etc. An energy-dense feed leads, for example, to a more efficient feed conversion rate. A 6-phase feeding regime is recommended as a framework guideline.
Intermediate phases allow flexible adjustment of supply to the needs of the birds. A 7-phase or multi-phase feeding regime may therefore also be appropriate.

Feeding regime: male birds						
Feeding phase	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6
Fattening week	1 - 2	3 - 5	6 - 9	10 - 13	14 - 17	18 - 22
Crude protein, %	27.5	26.0	22.0 - 23.5	20.0 - 21.0	17.0 - 18.0	15.5 - 16.5
Metabolisable energy, MJ / kg	11.4 - 11.6	11.6 - 11.8	12.0 - 12.2	12.4 - 12.6	12.7 - 12.9	13.1 - 13.3
Methionine, %	0.65	0.60	0.55	0.50	0.46	0.42
Methionine + cystine, %	1.10	1.00	0.95	0.85	0.80	0.75
Lysine, %	1.75	1.60	1.45	1.25	1.15 - 1.20	1.00 - 1.10
Threnonine, %	1.05	1.00	0.90	0.77	0.74	0.68
Tryptophan, %	0.29	0.26	0.24	0.21	0.19	0.17
Methionine (digestible), %	0.58	0.55	0.50	0.46	0.42	0.38
Methionine + cystine, (digestible) %	0.98	0.93	0.84	0.75	0.70	0.66
Lysine (digestible), %	1.58	1.46	1.31	1.14	1.05 - 1.10	0.91 - 1.00
Threnonine (digestible), %	0.88	0.81	0.75	0.64	0.62	0.56
Tryptophan (digestible), %	0.25	0.23	0.21	0.19	0.17	0.15
Calcium, %	1.30 - 1.35	1.25 - 1.30	1.05 - 1.15	0.90 - 1.00	0.75 - 0.85	0.65 - 0.75
Phosphorus, %*	1.00	1.00	0.60 - 0.70	0.55 - 0.60	0.50 - 0.55	0.40 - 0.50
Phosphorus (digestible), % min.	0.65	0.65	0.40	0.32	0.28	0.24
Sodium, %	0.15	0.15	0.15	0.15	0.15	0.15
Linoleic acid, % max.			2.30	2.30	2.30	2.30
Linolenic acid, % max.			0.23	0.23	0.23	0.23
Feed requirement						
Male (kg/phase)**	0.46	2.39	7.64	12.34	15.72	22.34
Male cum. (kg)**	0.46	2.84	10.49	22.82	38.54	60.88
	Fine/coarse granulate					
Pellet size	2 mm	2 mm	3 mm	3 mm	3 mm	3 mm

* 1.) The specifications listed above represent the minimum requirements and can be increased as required.
* 2.) The Ca/P ratio must be considered during optimisation.
* 3.) Addition of phytase is required.

**BUT 6

Feeding regime: female birds						
Feeding phase	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6
Fattening week	1 - 2	3 - 5	6 - 9	10 - 13	14 - 15	16
Crude protein, %	27.5	26.0	22.0 - 23.5	20.0 - 21.0	17.0 - 18.0	15.0 - 16.0
Metabolisable energy, MJ / kg	11.4 - 11.6	11.6 - 11.8	12.0 - 12.2	12.4 - 12.6	12.7 - 12.9	13.1 - 13.3
Methionine, %	0.65	0.60	0.55	0.50	0.46	0.42
Methionine + cystine, %	1.10	1.00	0.95	0.85	0.80	0.75
Lysine, %	1.75	1.60	1.45	1.25	1.15 - 1.20	1.00 - 1.10
Threnonine, %	1.05	1.00	0.90	0.77	0.74	0.68
Tryptophan, %	0.29	0.26	0.24	0.21	0.19	0.17
Methionine (digestible), %	0.58	0.55	0.50	0.46	0.42	0.38
Methionine + cystine (digestible), %	0.98	0.93	0.84	0.75	0.70	0.66
Lysine (digestible), %	1.58	1.46	1.31	1.14	1.05 - 1.10	0.91 - 1.00
Threnonine (digestible), %	0.88	0.81	0.75	0.64	0.62	0.56
Tryptophan (digestible), %	0.25	0.23	0.21	0.19	0.17	0.15
Calcium, %	1.30 - 1.35	1.25 - 1.30	1.05 - 1.15	0.90 - 1.00	0.75 - 0.85	0.65 - 0.75
Phosphorus, %*	1.00	1.00	0.60 - 0.70	0.55 - 0.60	0.50 - 0.55	0.40 - 0.50
Phosphorus (digestible), % min.	0.65	0.65	0.40	0.32	0.28	0.24
Sodium, %	0.15	0.15	0.15	0.15	0.15	0.15
Linoleic acid, % max.			2.30	2.30	2.30	2.30
Linolenic acid, % max.			0.23	0.23	0.23	0.23
Feed requirement						
Female (kg/phase)**	0.42	2.08	6.16	9.86	5.91	3.07
Female cum. (kg)**	0.42	2.50	8.66	18.52	24.43	27.50
	Fine/coarse granulate					
Pellet size	2 mm	2 mm	3 mm	3 mm	3 mm	3 mm

* 1.) The specifications listed above represent the minimum requirements and can be increased as required.
* 2.) The Ca/P ratio must be considered during optimisation.
* 3.) Addition of phytase is required.

**BUT 6

7 FEEDING

NOTE:

Monitor animal weights and adjust feed to development. This means that more than 6 phases are also possible.

Recommended framework for the amino acid profile relative to lysine (based on an ideal protein):

Relative to lysine	P1	P2	P3	P4	P5	P6
Lysine	100	100	100	100	100	100
Methionine	37	37	37	38	38	39
Methionine + cystine	64	65	65	66	67	68
Threonine	60	60	61	61	62	62
Tryptophan	17	17	17	17	17	17
Arginine	105	105	105	105	105	105
Valine	70	70	70	70	70	70
Isoleucine	62	62	62	62	62	62
Digestible lysine	100	100	100	100	100	100
Digestible methionine	38	38	38	39	39	40
Digestible methionine + cystine	63	64	64	65	66	67
Digestible threonine	56	56	56	57	57	58
Digestible tryptophan	16	16	16	16	16	16
Digestible arginine	105	105	105	105	105	105
Digestible valine	68	68	68	68	68	68
Digestible isoleucine	61	61	61	61	61	61

7.1.3 FEEDING REGIMES: FLEXIBLE APPLICATIONS

Example of a commonly used "diet ration"

PROBLEM: "Over-stressing" of the intestine (e.g. diarrhoea)
POSSIBLE SOLUTION: Use of a nutrient-poorer ration ("diet feed")

Feed type/ week	ME, MJ/kg	Crude protein, %	Methionine, %	Meth. + Cys., %	Lysine, %
P3 (6 - 9)	11.8	22.0	0.55	0.95	1.45
P4 (10 - 13)	12.2	19.5	0.50	0.85	1.25

ATTENTION:

Do not use for too long to ensure that growth compensation is still possible.

Example of a commonly used "energy ration"

PROBLEM (EXAMPLE): Weight specifications are not reached, e.g. during high temperatures
POSSIBLE SOLUTION: Use of a higher nutrient density diet

Feed type/ week	ME, MJ/kg	Crude protein. %	Meth. + Cys., %	M+C., %	Lys, %
P5 (14 - 17)	13.2	18.5	0.50	0.85	1.25
P6 (18 - End)	13.3	16.5	0.46	0.85	1.15

NOTE:

High-energy rations must always also have a higher protein and amino acid content to ensure the animals continue to gain weight.

7.2 FEEDING TABLES

7.2.1 FEED CONSUMPTION

The following feed consumption figures can be regarded as guidance values.

		Males		Females	
Phase	Pellet size	kg/Phase	cum. (kg)	kg/Phase	cum. (kg)
1	2 mm	0.46	0.46	0.42	0.42
2	2 mm	2.39	2.84	2.08	2.50
3	3 mm	7.65	10.49	3.16	8.66
4	3 mm	12.34	22.82	9.86	18.52
5	3 mm	15.72	38.54	5.91	24.43
6	3 mm	22.34	60.88	3.07	27.50

7.2.2 WATER CONSUMPTION

Good water quality is absolutely essential for rearing and fattening. Well water can only be used if the drinking water quality is tested at regular intervals. The birds should always have access to fresh water. Water consumption by turkeys is approx. double the feed consumption at the start of the fattening period and exhibits a decreasing tendency over the course of fattening. However, it can fluctuate considerably, e.g. due to:

- Feed composition
- Performance level (age) of the animals
- Environmental temperature
- Humidity
- Health status

A shift in the feed-water ratio over several days can be an alarm signal for health-related problems in the animals.

		Males Water consumption		Females Water consumption	
Week	Days	l/day	l/week	l/day	l/week
1	7	0.06	0.32	0.06	0.29
2	14	0.11	0.60	0.10	0.55
3	21	0.18	1.02	0.16	0.92
4	28	0.26	1.55	0.22	1.36
5	35	0.34	2.13	0.29	1.82
6	42	0.43	2.73	0.35	2.28
7	49	0.51	3.31	0.41	2.71
8	56	0.58	3.85	0.47	3.12
9	63	0.65	4.34	0.52	3.51
10	70	0.70	4.76	0.57	3.87
11	77	0.75	5.11	0.62	4.19
12	84	0.79	5.41	0.65	4.46
13	91	0.82	5.66	0.67	4.66
14	98	0.85	5.86	0.69	4.79
15	105	0.87	6.05	0.70	4.86
16	112	0.90	6.21	0.70	4.88
17	119	0.92	6.36	0.69	4.87
18	126	0.94	6.51	0.69	4.85
19	133	0.96	6.66	0.70	4.87
20	140	0.98	6.80	0.71	4.93
21	147	1.00	6.95	-	-
22	154	1.02	7.10	-	-
23	161	1.05	7.26	-	-
24	168	1.08	7.47	-	-

7.3 FEED INTAKE

Feed intake is crucial, in addition to optimisation of the nutrient supply. Feed intake can be influenced by a number of factors:

- Energy content of the feed (feed intake is higher for energy-poorer rations than for energy-richer rations - and vice versa).
- Amino acid imbalances or deficiencies (excessive over- and under-supply can reduce the intake).
- Anti-nutritive feed ingredient (e.g. poorly digestible non-starch polysaccharides (NSP), bitter substances).
- Water deficiency (turkeys react by reducing feed intake).
- Husbandry and environmental factors (e.g. reduction in feed intake during heat or when height of the feed conveyor is not set correctly.

7.4 FEED STRUCTURE AND PELLET QUALITY

The feed in Phase 1 (P1) can be offered in two forms to improve the initial conditions for the poults:

a Coarsely ground fine material and

b coarsely structured solid material (granulate and 2 mm pellets)

HELPFUL:

Finely structured material in sacks can be used to make individual combinations for a "fine-coarse menu" and for adjustments to the given requirements of the poults (composition as in P1).

NOTE:

Only provide the best feed quality for the poults.

ATTENTION:

The poults should be able to consume as much feed as possible in the first few days for optimum development.
Reduction in feed intake or rejection of feed may cause gastrointestinal diseases.

1. Offering more helps.
2. Regular encouragement to eat.
3. Regularly remove feed middlings that are too fine.

Transitions between feed phases must be smooth and not made abruptly. If possible, before rehousing, the target housing feed should be given to the animals for a while beforehand so they get used to it.

Good pellet quality with a low middling content is just as important for optimum development as the nutrient content.
Apart from the pellet formulation and technology in the feed plant, the quality of pellets can also be compromised in the farm area, for example, through

- delivery pressure that is too high and insufficient time taken when filling the silo,
- long conveyance paths and convoluted feed lines,
- diameter of the lines too small,
- worn piping systems.

IMPORTANT:

Attempts should be made to provide the poults with constant, good pellet quality as they react sensitively to changes in the physical structure (high middling content). Consequences may be reduced growth, digestive system disorders and poor uniformity.

7.5 SELECTION OF INGREDIENTS

Excessive use of ingredients with large contents of anti-nutritive substances can lead to permanent disorders. The selection and limitation of different components can reduce the risk.

NOTE:

Do not use final fattening fat blends for poults to avoid digestive system disorders.

Example of limitations when selecting the components for a 6-phase feed:

Feeding phase	P1	P2	P 3	P4	P5	P6
Components	%	%	%	%	%	%
Wheat	5 - 40	25 - 50	25 - 55	25 - 60	30 - 65	35 - 70
Wheat by-products	0 - 5	0 - 10	0 - 15	0 - 15	0 - 15	0 - 15
Maize	10 - 35	10 - 35	10 - 35	10 - 35	10 - 35	10 - 35
Maize by-products	-	-	-	-	0 - 15	0 - 15
Triticale	-	-	0 - 10	0 - 10	0 - 15	0 - 15
Barley	-	-	-	0 - 5	0 - 10	0 - 10
Plant-based oils and fats	1 - 4	1 - 4	2 - 6	2 - 7	2 - 7.5	2 - 8.5
Steam-preserved soya extraction groats	30 - 55	25 - 50	20 - 45	10 - 40	5 - 30	2 - 25
Steam-preserved soya beans	0 - 20	0 - 18	0 - 10	0 - 10	0 - 5	0 - 5
Leguminoses (peas and beans)	-	-	0 - 5	0 - 8	0 - 10	0 - 15
Rape and sunflower products	-	-	0 - 5	0 - 5	0 - 7	0 - 10

7.6 PHYTASES

A reduction in the quantities of Ca and P by 0.1 to 0.2 (from P3 onwards) is recommended when using phytases to improve P availability.
Important prerequisite: readily available sources of Ca and P (e.g. monocalcium phosphate, especially for poults).

7.7 NSP ENZYMES

NSP enzymes cleave the so-called non-starch polysaccharides in cereals and oil seed that the intrinsic enzymes in turkeys cannot break down and thus release valuable energy and protein. They have proven effective as they improve the viscosity of the food in the stomach, improve feed conversion rates and result in dryer litter. NSP enzymes are commonly found in feed formulations.

7.8 GRAIN SUPPLEMENTS

The farm's own grain used as a supplement can improve the ration.
When adding cereals (e.g. wheat), the general formulation or the supplement formulation is adjusted to the specified quantity of grain according to the feeding regime.

ATTENTION:

High supplementation of the standard feed with cereals results in a "dilution effect" on the nutrient concentrations.

The concentration of the supplement must be increased accordingly to ensure the recommended amino acid uptake remains unchanged.

IMPORTANT:

Gradual transition from the standard feeding programme to supplementary grain feeding must not take place too early on (from approx. week 6) and only using small quantities (start with approx. 5 %, and gradually increase).

ATTENTION:

Grain qualities and contents are subject to natural fluctuations, which cannot be entirely taken into consideration by the manufacturers of the supplementary feed. Laboratory analyses can help here.

HELPFUL:

Make grit available, or crush or crack the cereal to improve digestion.

7.9 ADDITION OF GRIT

The addition of grit not only supports digestion in general, but has also been shown to help break down the feed in the gizzard.
Only use insoluble, small stones for this purpose - based on age - e.g. from quartz grit. While shell grit can also be used as an additional source of Ca, it dissolves in the stomach and therefore loses its grinding effect.
Grit must not be made freely available as individual birds are commonly observed feeding preferentially from these feeders. Regular addition to the feed in the troughs is therefore recommended.

IMPORTANT:

Grit must be discontinued at least 3 weeks before slaughter to ensure the stomach has no stones in it during the slaughter process.

Example of the addition of grit to the feed depending on age in weeks and the diameter of the material:

- 2 to the end of 3 weeks of age: 1 - 2 mm (1 - 2 x per week)
- 4 to the end of 12 weeks of age 2 - 4 mm (1 - 3 x per week)
- Male birds: 13 to the end of 16/17 weeks of age 4 - 6 mm (1 - 3 x per week)

8 GROWING PERFORMANCE DATA

8.1 TURKEY BREEDING

The heavy strains of fattening turkeys available in Europe are bred by crossing different baseline strains. Breeds like B.U.T. 6, Nicholas Select (TP 7) or Hybrid Converter are produced by crossing 4 grandparent lines, which then combine various positive characteristics from their father and mother lines, such as fitness, feed conversion rates, weight gain or laying performance of the parent animals.

A total of over 40 traits are considered when deciding on a candidate for breeding. The traits are assessed based on the individual performance of the breeding candidate, but also by using sibling data. High-tech methods, such as computed tomography or feed and water documentation systems with RFID technology are helpful for data collection. This has been added to with the introduction of genomic selection, yielding precise information on the characteristics of the animals from DNA analysis, which enormously increases advances in breeding. For example, this also allows laying potential to be assessed via the genome in male animals.

These advances in breeding thus result in a continuous improvement in both animal performance, as well as fitness and robusticity of the turkeys. The speed of advances and the accuracy of estimates of breeding value have increased significantly in recent years thanks to these new techniques.

As an example, the current performance aims are given in the appendix for B.U.T. 6.
Other performance aims for Nicholas Select, Hybrid Converter or Bronze lines, such as Auburn, can be accessed on www.kartzfehn.de.

8 GROWING PERFORMANCE DATA

8.2 GROWING PERFORMANCE B.U.T. 6 MALES

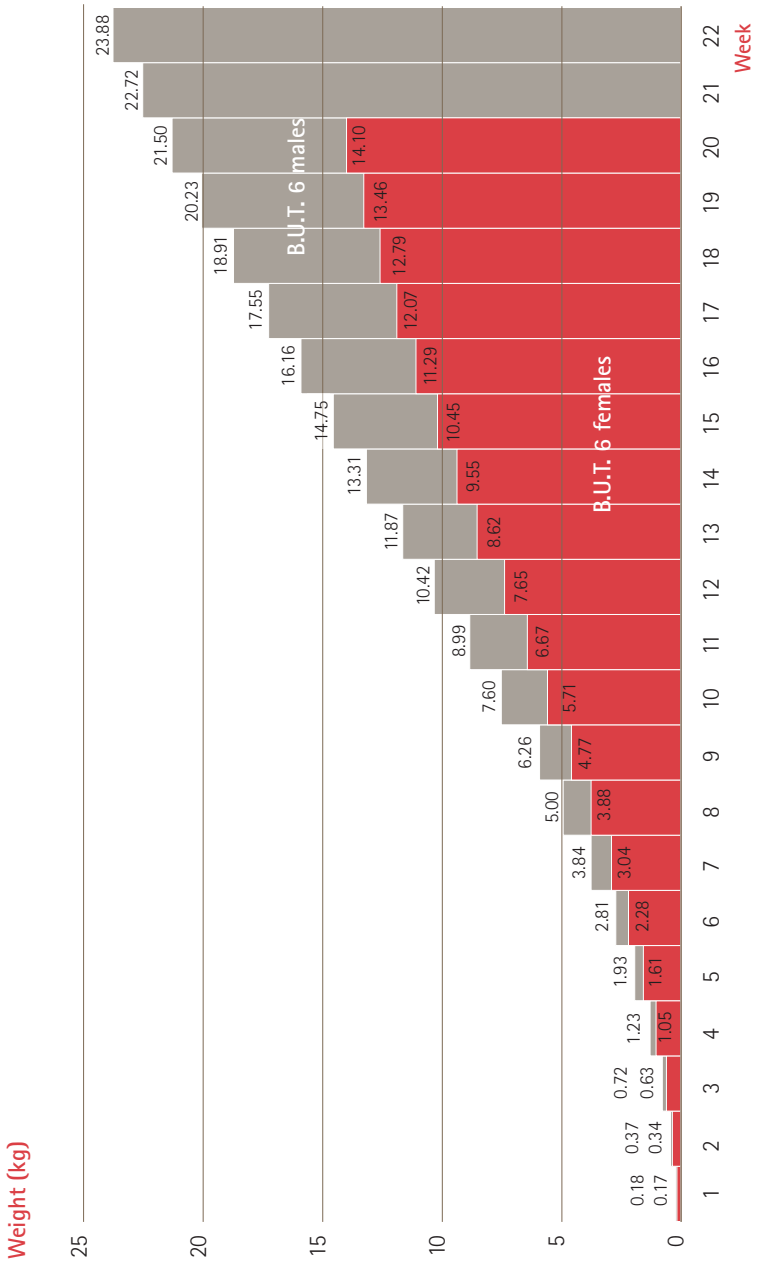
Week	Days	Weight (kg)	Cum. daily weight gain (g/day)	Cum. FCR (kg/kg)	Feed/day (g)	Water/day (l)
1	7	0,18	25	0,90	23	0.06
2	14	0,37	27	1,22	43	0,11
3	21	0,72	34	1,35	73	0,18
4	28	1,23	44	1,42	112	0,26
5	35	1,93	55	1,47	156	0,34
6	42	2,81	67	1,52	202	0,43
7	49	3,84	78	1,57	250	0.51
8	56	5,00	89	1,62	297	0,58
9	63	6,26	99	1,68	342	0,65
10	70	7,60	109	1,73	385	0,70
11	77	8,99	117	1,80	424	0,75
12	84	10,42	124	1.86	460	0,79
13	91	11,87	130	1.92	494	0,82
14	98	13,31	136	1.99	524	0,85
15	105	14,75	140	2.06	551	0,87
16	112	16,16	144	2,13	575	0,90
17	119	17,55	148	2,20	596	0,92
18	126	18,91	150	2,27	615	0,94
19	133	20,23	152	2,34	630	0,96
20	140	21,50	154	2,41	641	0,98
21	147	22,72	155	2,48	650	1,00
22	154	23,88	155	2,55	655	1,02

8 GROWING PERFORMANCE DATA

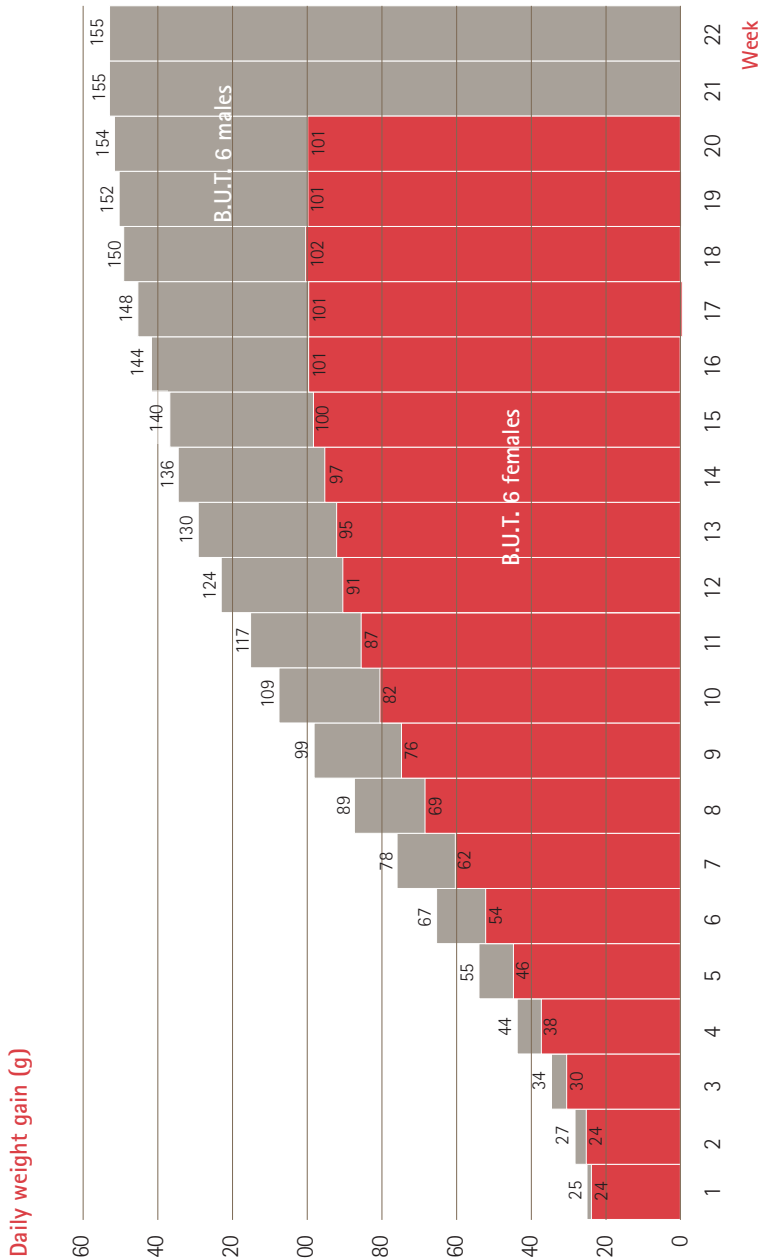
8.3 GROWING PERFORMANCE B.U.T. 6 FEMALES

Week	Days	Weight (kg)	Cum. daily weight gain (g/day)	Cum. FCR (kg/kg)	Feed/day (g)	Water/day (l)
1	7	0,17	24	0,88	21	0,06
2	14	0,34	24	1,25	39	0,10
3	21	0,63	30	1,41	66	0,16
4	28	1,05	38	1,49	98	0,22
5	35	1,61	46	1,55	133	0,29
6	42	2,28	54	1,61	168	0,35
7	49	3,04	62	1,67	203	0,41
8	56	3,88	69	1,74	237	0,47
9	63	4,77	76	1,81	272	0,52
10	70	5,71	82	1,89	306	0,57
11	77	6,67	87	1,97	339	0,62
12	84	7,65	91	2,06	369	0,65
13	91	8,62	95	2,15	394	0,68
14	98	9,55	97	2,24	415	0,69
15	105	10,45	100	2,34	429	0,70
16	112	11,29	101	2,44	439	0,70
17	119	12,07	101	2,54	445	0,69
18	126	12,79	102	2,64	449	0,69
19	133	13,46	101	2,74	455	0,70
20	140	14,10	101	2,85	464	0,71

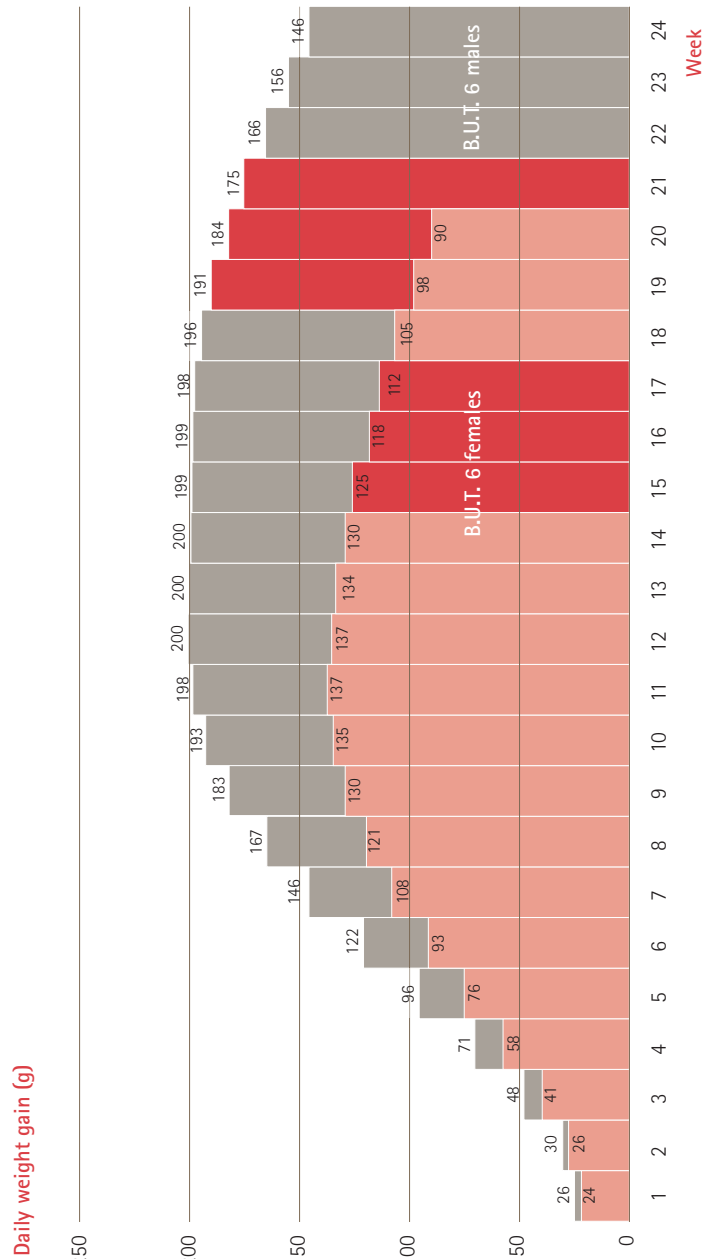
8.4 GROWING PERFORMANCE B.U.T. 6



8.5 DAILY WEIGHT GAIN (CUMULATIVE) B.U.T. 6



8.6 DAILY WEIGHT GAIN/WEEK B.U.T. 6



NOTES

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