

## Management Guide for Økologisk production of Turkeys, Ducks, and Geese in Denmark

### Introduction

Before World War two, it was common practice to raise turkeys, ducks, and geese for sale or for personal use. At that time, chickens were primarily kept for eggs and were only eaten after they stopped laying. Thus, chicken was not regarded for meat or flavor like turkeys, ducks, and geese where. However, this changed with the creation of large-scale farming chicken during WWII. During the war, there was a large demand for food and meat to feed soldiers, while at the same time a low supply of labor. After the war, chicken became a cheap source of meat that was widely available. This led to chicken becoming the poultry king it is today, pushing aside other poultry species. Today, turkeys, ducks, and geese are rising in popularity as a specialty product in which consumers and restaurants are willing to pay more for quality than quantity. This makes økologisk and free-range production ideal for these high value birds. This guide will provide a step by step outline for producers interested in raising turkeys, ducks, or geese organically for the first time.

### Turkey

#### *Introduction/market strategy*

Once a bird only raised seasonally in time for Thanksgiving (US and Canada) and Christmas, has now grown in popularity and demand as a healthy lean meat. Turkey breast is currently being marketed in several different ways. It can be sold as a whole bird for roasting during the holidays, these birds can be slaughtered anytime and then frozen ahead of time, or sold fresh to the consumer for a higher price. But the largest market growth is in turkey breast, whole or ground, as an alternative as a leaner and healthier meat. Turkey is also a very popular deli meat. Turkeys are typically divided by sex in the hatcheries and raised separately due to their different growth rates, final weight, and slaughter age. Roasting turkeys are typically females, and turkeys for breast or ground meat are typically males.

#### *Getting started*

Before the chicks arrive, several decisions and preparations need to be made first.

#### Breed

Most large scale farmers raise modern heavy weight breeds because of their higher final weight, faster growth, and larger breast size. However, slower growing heritage breeds are more suited for free range production as they are naturally better foragers and more resistant to disease.

##### *Bourbon Reds*

This heritage breed is known for taste and flavor in their meat and good nature making them easy to handle. They are a slower growing breed and take about 6 months to reach market weight. Females can reach 5.5-8 kg and males reach about 10-15 kg.

##### *Broad Breasted Whites*

Considered the modern turkey breed, this is the most commonly raised commercial breed. These turkeys have the highest feed to gain conversion ratio, and grow the fastest. This breed is believed to be more prone to diseases, leg and wing problems, and may not be suitable for organic or free range production.

#### *Standard Bronze*

While still considered a heritage breed, this large breed is also grown commercially. Females typically weigh about 7 kg and the males weigh about 11 kg.

#### *Royal Palm*

Mostly considered an ornamental heritage breed due to their small size and beautiful plumage, they are good for weed and insect control. Females will reach about 4.5 kg and males reach about 7 kg.

#### *Narragansett*

Slow growing heritage breed that is known for a high meat quality. This breed can be maintained with low levels of little supplementation with concentrates as they are strong foragers and can be used to control insect populations. At full size, females weigh about 5.5-7 kg and males weigh about 10-13 kg.

### Housing

If you do not have a poultry barn already or would like to raise your bird's completely free range, some kind of shelter or mobile barn is still needed for the first 3-6 weeks. This shelter does not need to have a floor, but does need a roof and protection to wind as chicks are very sensitive to temperature.

If you already have a poultry barn you would like to use, first ensure that it meets the økologisk requirements. A økologisk poultry barn cannot be larger than 1,600 m<sup>2</sup> of useable space, must contain a sufficient amount of perches, have exit and entry holes large enough for turkeys with a combined length of at least 4m per 100 m<sup>2</sup>, have natural lighting, and at least one third of floor space is solid (not slated or gird flooring) with litter of straw, wood shavings, sand, or turf. If your poultry barn is already approved for økologisk broiler production, then the additional perches and taller entry and exit holes should be sufficient changes to meet requirements for turkeys. While not required, it is recommended to change any artificial lighting to LEDs as turkeys are sensitive to the blue-green light found in incandescent or fluorescent lights.

For økologisk production, it is required that birds have access to the outdoors for at least one third of their life. As such, fenced in outdoor runs will need to be constructed large enough for each turkey to have 10 m<sup>2</sup> of outdoor space. Keep in mind that the fence should be at least 2 m otherwise the turkeys can jump over it. If raising turkeys completely on pasture, then more outdoor space may be needed than 10 m<sup>2</sup> per bird. The outdoor area must contain open air and vegetative cover. It is recommended for

turkeys to provide some wooded area as this is their native habitat. Outdoor areas should have well draining soil to prevent pooling and muddy patches.

#### Stocking rate

EU økologisk legislation limits each poultry house to 2,500 turkeys at one time. Regardless, producers still need to be below the 170 kg N per year per ha limit. Thus for every 120 male turkeys or 260 female turkeys you will need a ha of land to meet the 170 kg N limit assuming an average slaughter age of 140 days for males, and 120 days for females.

#### Preparations for arrival of chicks

For production in a poultry house, part of the floor space should be selected and sectioned off for the brooding phase. In this section, about 5 cm litter should be placed to effectively cover the floor. Rings constructed from wood boards, straw bales, or plastic rings should be placed on the floor with a brooder in the center. The barriers should be about 1 m tall and should be placed such that no sharp corners are formed. Young chicks will often get stuck in corners and will not be able to find feed or water. Read the directions for your specific brooder to determine the max size of the ring, height at which the brooder should be placed, and the number of chicks per brooder. If number of turkey chicks per brooder is not on directions, place about 1/3 of the chicken recommendation. Feed and water should be placed inside the ring, but not directly under the brooder. Small bell water dispensers designed for chicks should be used with about 1 for every 25 chicks is needed. The open water should encourage the chicks to drink. Starter feed should also be placed on several bright aluminum pans to attract the birds to the feed and encourage consumption (turkeys are attracted to shiny objects). The number of feed pans needed depends on the number of chicks and the size of the pan. (See Figure 1 in Tables and Figures for a visual guide). Turkey starter feed should be used, but if it is not available, unmedicated chicken starter feed may be used instead. If using chicken starter feed, additional protein will need to be added as chicken starter has about 23% crude protein, but turkeys need 28-30% crude protein. The vitamin and mineral content in the feed purchased should be compared to the NRC turkey requirements listed in the feed recommendations section, since it may be necessary to add additional vitamins and minerals to the feed or water. Turkey chicks should also have access to granite chick grit from day 1.

For an outdoor mobile house, litter is not needed if the building does not contain a floor provided the ground is not muddy. A brooding ring should also be constructed like in the poultry house, but a brooder may not be necessary if the weather is at least 35°C day and night.

About 24 hours before the chicks arrive, brooders should be turned on and set to 35-38°C with high humidity to ensure the barn is warm enough by the time they arrive. At this time feed, and water should be checked and ensure that everything is set up properly for their arrival.

#### *Week 1- Chicks arrive*

When the chicks arrive, quickly and carefully place them into a brooder ring. Be sure not to place too many chicks in a ring as this may limit their ability to get enough food, water, and warmth. In order to

encourage the chicks to eat and drink immediately it is recommended to place them next to a food or water source. After the chicks have settled in, about 1-2 hours after arrival, walk through and check on the chicks. The most important thing to look at is their behavior. If birds are all gathered together under the heater, they are too cold and the heater should be turned up. If they are all around the outer fringes of the pen and gasping, they are too hot and the heater should be turned down or lifted higher. If they gather in only one particular area, it is too draughty and a higher ring barrier should be placed to block the draught. If the birds are roaming around in and out from the heat source, then the conditions are perfect. If the birds have sweaty backs, the humidity is too high and you will need to increase ventilation; if not, this will promote pecking. (See Figure 2 in Tables and Figures section for a visual guide). Any chicks found lying on their backs should be flipped over because they cannot do it themselves and will suffocate. Also look for any chicks that appear weak and struggling. They may need to be moved closer to the brooder or to water if you suspect they have not drunk yet. Chicks should be checked on hourly for the first few days and then 2-3 times a day after that provided there are no longer issues with weak chicks. During this time, feed and water should be replenished, behavior evaluated, and any dead chicks removed.

It is also recommended to have continuous bright lights for the first 3 days to encourage eating and drinking and then switch them to standard lighting program.

### *Week 2*

At the start of week 2 the brooder rings/barriers may be removed. However, if this is the only thing keeping the chicks inside the mobile building, they should be left in place until week 4. Chicks should not have full access to the barn yet. Therefore some barriers may need to remain to keep the chicks from having too much space. If not already done, the brooder temperature should be reduced to about 32°C. If using artificial lighting, do not extend day light beyond 14 hours as this will stunt growth and leg bone development. Continue to monitor the chicks several times a day like in week 1.

### *Week 3*

If not already done, the brooder temperature should be reduced to about 29°C. A small amount of chick grit can be added to their feed. Accessible area can also be further expanded. Continue to monitor the chicks several times a day like in week 1.

### *Week 4-8*

The crude protein level can be reduced to 26% in the feed. So if using chicken starter, continue adding protein, but not as much. Continue to lower the brooder temperature by 2-3°C each week until ambient temperature is reached or birds are fully feathered (about week 6-8). When this occurs, brooders may be removed and chicks given access to the rest of the barn and switched to automatic feed and water systems. If raising turkeys free-range in the summer, they can be allowed on pasture during the day once mostly feathered (week 5 or 6), but may still want to bring them inside for cold evenings.

### *Week 8-20*

By the end of week 8 the turkeys should be fully off the brooders. The diet should also be switched to a grower feed. Continue feeding a grower diet, but diet may need to be adjusted from time to time to meet requirements and slow growth.

Depending on the size of your turkeys and the outdoor temperature, they can be given outdoor access during this period. Lights should be turned on in the evening to encourage the birds to come inside for the night. This will reduce losses due to predation. However, light period may not exceed 16 hours.

If raising them free-range with out a barn or structure, be sure to provide a wooded area or perches/roosts so the birds may sleep above ground. Turkeys prefer to sleep high above the ground so they can stay away from potential predators at night. Providing perches will also keep the turkeys from trying to roost on your fence.

### *Slaughter*

Starting at 100 days of age for females and 140 days for males, the turkeys can be caught and slaughtered. Slaughter weight for females is typically about 6-7 kg and 12-14 kg for males. Feed should be withheld for 24 hours before slaughter to reduce gut fill, but water should still be provided.

### *After slaughter*

After the birds are removed for slaughter, the barn should clean and prepped for the next batch. This involves complete removal of any litter, cleaning and disinfecting the barn. Feeders should also be completely cleared of old feed then disinfected, and drinkers flushed and disinfected. The pasture and run areas should be allowed to rest and may need re-seeded to allow for enough vegetative cover to return. If raising free-range turkeys, the pastures used should rest between batches and rotated at least every 2 batches. Soil in these pastures and runs can be treated with lime before resting for a year to reduce the parasitic load in the soil

### *Breeding*

Turkeys will start to lay as young as 28 weeks old. Turkeys will start to lay as day length increases (spring) and will lay for 26 consecutive weeks. For indoor production this can be simulated by using a lighting program. In outdoor production, laying will begin about April. During this period turkeys will lay up to 100-130 eggs if they are removed regularly. Otherwise they will lay about 8-15 eggs and then start the incubation process. Almost all domestic turkey breeds are unable to breed naturally and will need to be artificially inseminated in order to produce fertile eggs. After insemination, a hen will lay fertile eggs for 4 weeks. Fertile eggs are incubated for 28 days before then start to hatch. Unfertilized turkey eggs can also be collected at sold as a specialty product.

### *Disease management*

Coccidiosis

This protozoan disease typically infects immature turkeys. Coccidian found in chickens and other birds and animals do not infect turkeys. Symptoms include weakness, drooping wings, ruffled feathers, and head drawn back into shoulders, listlessness, and light brown and often bloody diarrhea with odor. Feces from infected birds can be brought on your farm via crates, equipment, shoes, clothes, and other animals. Once this protozoon is present on your farm it is impossible to kill/remove. There is a vaccine available, but many farmers try giving apple cider vinegar as a cheaper, prophylactic treatment.

#### Flukes

Birds kept near marshy areas are more likely to be exposed to hosts and drink from natural water that is contaminated. Exposure will result in large, shiny cysts on the skin of the abdominal area of young turkeys. Flukes may also cause milky discharge from the cloaca.

#### Blackhead disease/Histomoniasis

This disease is caused by a protozoon whose eggs can be found in the soil, earthworms, or the fecal of infected birds. Symptoms include increased thirst, decreased appetite, watery and sulfur-colored droppings, drowsiness, weakness, dry-ruffled feathers, and dark cyanotic head. This disease has a high mortality rate, especially among turkeys less than 12 weeks of age. Prevention involves keeping turkeys away from other poultry species and rotate pastures frequently. Contact vet if you start to see symptoms to discuss treatment options.

#### Blue comb/turkey coronavirus

This viral infection of the gastrointestinal tract is highly contagious and effects turkeys of all ages, but mortality rates decrease with age. Symptoms include depression, low body temperature, diarrhea, reduced feed intake, weight loss, dehydration, prostration, and death. Birds that survive will still have stunted growth. As a farm manager you can choose to cull your whole flock or just those showing symptoms, or try and wait it out. There is no treatment. After the farm/barn is emptied of birds, it must be decontaminated and disinfected, and then left vacant for 30 days. Biosecurity practices should also be re-evaluated to prevent reoccurrences.

#### Bumblefoot

Typically prompted by small cuts and lesions on the foot, that then gets infected (staphylococcus) causing hard swelling in the center of the foot pad and cracking under the feet. If you notice this in your flock, go through your pastures and barns removing any sharp objects such as rocks, glass, nails, metal, ect. Bumblefoot can also be caused by stress, overcrowding, poor sanitation, roosts placed too high, and flooring that is too hard.

#### Enlarged Hock Disease

Symptoms start with a slight enlargement of the hock at 2 weeks of age, which then returns to normal size at 4 weeks. The hock swells again at 14-16 weeks. This disease also causes weak legs and feet, breast blisters, and abscesses. This disease caused by a deficiency in vitamin D3 and calcium coupled

with staphylococcus and/or mycoplasma organisms. Avoid moldy feed and do not treat birds with tetracycline medications as this can cause the disease due to its interruption with calcium absorption.

### Stampeding

Turkeys can get scared easily to the point where they will run and fly into walls and roofs causing damage to them. They may also crowd into a corner of the building, smothering each other. Keeping predators away from your flock is very important. However, if you have a particularly skittish flock, night lights around the barn may reduce the amount of shadows that may cause them to scare.

### Aspergillosis (brooder pneumonia)

This fungal infection mostly effects pullets between the age of 5 days to 8 weeks of age and is caused by inhalation of the spores. The mold may grow on damp feed or litter. Straw that has been damp is very susceptible. Symptoms include heavy or rapid breathing, dehydration, lesions in the respiratory tract and lesions around and in the eyes. There is no cure, therefore management is important. Remove any infected litter or feed completely. Increasing the humidity and controlling dust can reduce its spread.

### Avian flu

Turkeys are more susceptible to avian flu than wild birds, chicken, and pigs. This makes raising turkeys with outdoor access difficult in areas where avian flu is present. Symptoms include sneezing, coughing, ocular and nasal discharge, swollen infraorbital sinuses, blue discoloration and swelling of the head, comb, wattle, and snood; swelling and red discoloration of the shanks and feet; and blood-tinged oral and nasal discharges. In severely affected birds, greenish diarrhea is common. Symptoms and mortality rates vary with severity and strain of virus. If you suspect an occurrence of avian flu, especially if reported in your area, call your vet immediately.

### Environmental stress

Turkeys are very sensitive to stress especially when changes in diet, housing, temperature, and other environmental factors can cause stress hormones to be released. These hormones enter the gut, causing the activity of bacteria like *E. coli* and *Salmonella spp.* to increase, which can lead to enteritis, dysbacteriosis, and increased susceptibility to other diseases. To prevent this from occurring, many producers add probiotics to the water of turkeys when they are moved to a new location, or a change in diet occurs. Wet litter may indicate environmental stress.

### Heat stroke

Turkeys are sensitive to high temperatures. Temperatures above 27°C will result in reduced feed intake and gain. Temperatures above 32°C will cause turkeys to experience heat stress and heat prostration. At this temperature, turkeys must be given shade and sprayed with water to prevent death.

### Predation

### Feed tables/recommendations

[illegible]



E	IU	12	12	10	10	10	10	10	25
K	mg	1.75	1.5	1.0	0.75	0.75	0.50	0.5	1.0
Water soluble vitamins									
B <sub>12</sub>	mg	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
Biotin <sup>h</sup>	mg	0.25	0.2	0.125	0.125	0.100	0.100	0.100	0.20
Choline	mg	1,600	1,400	1,100	1,100	950	800	800	1,000
Folacin	mg	1.0	1.0	0.8	0.8	0.7	0.7	0.7	1.0
Niacin	mg	60.0	60.0	50.0	50.0	40.0	40.0	40.0	40.0
Pantothenic acid	mg	10.0	9.0	9.0	9.0	9.0	9.0	9.0	16.0
Pyridoxine	mg	4.5	4.5	3.5	3.5	3.0	3.0	3.0	4.0
Riboflavin	mg	4.0	3.6	3.0	3.0	2.5	2.5	2.5	4.0
Thiamin	mg	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0

NOTE: Where experimental data are lacking, values typeset in bold italics represent estimates based on values obtained from other ages or relate species or from modeling experiments.

<sup>a</sup> The age intervals for nutrient requirements of males are based on actual chronology from previous research. Genetic improvements in body weight gain have led to an earlier implementation of these levels, at 0 to 3, 3 to 6, 6 to 9, 9 to 12, 12 to 15, and 15 to 18 weeks, respectively, by the industry at large.

<sup>b</sup> The age intervals for nutrient requirements of females are based on actual chronology from previous research. Genetic improvements in body weight gain have led to an earlier implementation of these levels, at 0 to 3, 3 to 6, 6 to 9, 9 to 12, 12 to 14, and 14 to 16 weeks, respectively, by the industry at large.

<sup>c</sup> These are approximate metabolizable energy (ME) values provided with typical corn-soybean-meal-based feeds, expressed in kcal ME<sub>n</sub>/kg diet. Such energy, when accompanied by the nutrient levels suggested, is expected to provide near-maximum growth, particularly with pelleted feed.

<sup>d</sup> Turkeys do not have a requirement for crude protein per se. There, however, should be sufficient crude protein to ensure an adequate nitrogen supply for synthesis of nonessential amino acids. Suggested requirements for crude protein are typical of those derived with corn-soybean meal diets, and levels can be reduced when synthetic amino acids are used.

<sup>e</sup> The calcium requirement may be increased when diets contain high levels of phytate phosphorus (Nelson, 1984).

<sup>f</sup> Organic phosphorus is generally considered to be associated with phytin and of limited availability.

<sup>g</sup> These concentrations of vitamin D are considered satisfactory when the associated calcium and phosphorus levels are used.

<sup>h</sup> Requirement may increase with wheat-based diets.

## Ducks

### *Introduction/market strategy*

Ducks were once a popular dish for Christmas and Easter holidays, but have been pushed aside by the popularity of the chicken. Today, duck is primarily associated with the holiday Mortensaften, but is not widely consumed outside of this holiday by Danes. This is because the average western consumer is intimidated by the bird due to lack of knowledge on how to prepare the bird and the fear that it will be both greasy and dry. Conversely, the Asian market for duck has boomed. In Asian, more specifically China, duck is a common and very popular meat and is even the national dish of China. Duck eggs are also very popular and are often used to make the Chinese dish “century egg”. As China has become more industrialized and wealthier, their demand for meat and eggs, especially duck, has been on the rise. Although it is unclear if China is willing to pay a premium for organic and free range duck products, the European consumers and restaurant market is. Duck and duck eggs are popular among higher end restaurants that are willing to pay more for quality than quantity.

### *Getting started*

Before the ducklings arrive, several decisions and preparations need to be made first. The first decision is to decide what your market strategy is going to be. Either you go for quantity for export to china or for local Asian markets, or quality for restaurants and consumers for special holidays. Second, decide what duck breed to raise. This will depend on what is available at your local hatchery, what your market wants, and management style. For example, if going for quantity for the Asian market, the Peking duck is your only choice. However, restaurants may prefer a Mallard heritage breed or the Muscovy ducks

(popular in France). This is because each of the three main breeds is so different; Peking, Muscovy, and Mallard, production management will be different for each. If considering raising ducks for egg production, consult your hatchery on what breeds are available and best for laying. A good laying duck should produce 200-300 eggs per year.

## Housing

If you do not have a poultry barn already or would like to raise your duck's completely free range, some kind of shelter or mobile barn is still needed for the first 2 weeks. This shelter does not need to have a floor as long as it is not muddy, but does need a roof and protection to wind as ducklings are very sensitive to temperature.

If you already have a poultry barn you would like to use, first ensure that it meets the økologisk requirements. For økologisk poultry production, the barn cannot be larger than 1,600 m<sup>2</sup> of useable space, must contain a sufficient amount of perches if raising Muscovy ducks, have exit and entry holes large enough for ducks with a combined length of at least 4m per 100 m<sup>2</sup>, have natural lighting, and at least one third of floor space is solid (not slated or gird) with litter of straw, wood shavings, sand, or turf. If your poultry barn is already approved for økologisk broiler production, then the additional perches and taller entry and exit holes should be sufficient changes to meet requirements for ducks. If raising Peking or Mallards these changes may not be needed given their similar size to chickens. Except for Muscovy's, ducks will not use perches, so they may not be required. While not required, it is recommended to use Pekino cup drinkers instead of nipple drinkers for ducks. This allows ducks to fully submerge their head when drinking and wet their feathers enough for preening.

For økologisk production, it is required that birds have access to the outdoors for at least one third of their life. As such, fenced in outdoor runs will need to be constructed large enough for each duck to have at least 4.5 m<sup>2</sup> of outdoor space. Note this is only 0.5 m<sup>2</sup> more than is required for chickens. If raising ducks completely on pasture, then more outdoor space may be needed than 4.5 m<sup>2</sup> per bird. The outdoor area must contain open air and vegetative cover. Since ducks are waterfowl, the outdoor area must contain a stream, pond, lake, or pool.

## Stocking rate

EU økologisk legislation limits each poultry house to 4,000 female or 3,200 males at one time. Regardless, producers still need to be below the 170 kg N per yr per ha limit. To achieve this it is recommended to keep no more than 190 ducks per ha, assuming an average slaughter age of 50 days. However this estimation may be lower for Muscovy ducks.

## Preparations for arrival of ducklings

For production in a poultry house, part of the floor space should be selected and sectioned off for the brooding phase. In this section, about 5 cm of litter should be placed to effectively cover the floor. Rings constructed from wood boards, straw bales, or plastic rings should be placed on the floor with a brooder in the center. The barriers should be about 1 m tall and should be placed such that no sharp corners are

formed. Young ducklings will often get stuck in corners and will not be able to find feed or water. Read the directions for your specific brooder to determine the max size of the ring, and the number of ducklings per brooder. If number of ducklings per brooder is not on directions, use the recommendation of chicks. The brooder should be hung about 45 cm from the floor unless specified on brooder directions. Feed and water should be placed inside the ring, but not directly under the brooder. Small cup water dispensers designed for chicks should be used with about 1 for every 50 ducklings depending on the size of the dispenser. The open water should encourage the ducklings to drink. Be aware that the ducklings will likely try and play in the water. Thus to reduce the mess and keep the litter dry longer, it is recommended to place the waters on a 2 cm wire mesh platform to keep the spilled water out of reach. If using a tray of water, the mesh can be placed on top to prevent swimming and playing in water. Starter feed should also be placed on flat open pans to attract the birds to the feed and encourage consumption. The number of feed pans needed depends on the number of ducklings and the size of the pan. (See Figure 1 in the Table and Figures section for a visual guide). Duck or waterfowl starter feed should be used. It is not recommended to use chicken starter feed for ducklings as this is too high in protein and has a very different balance of vitamins and minerals. If duck starter feed cannot be found, you should consider making your own, or consult a nutritionist on how to adjust a chicken starter feed to work for your ducklings.

For an outdoor mobile house, litter is not needed if the building does not contain a floor. A brooding ring should also be constructed like in the poultry house, but a brooder may not be necessary if the weather is at least 32°C day and night.

About 24 hours before the ducklings arrive, brooders should be turned on and set to 32-35°C to ensure the barn is warm enough by the time they arrive. At this time feed, and water should be checked and ensure that everything is set up properly for their arrival.

### *Week 1*

When the ducklings arrive, quickly and carefully place them into a brooder ring. Be sure not to place too many ducklings in a ring as this may limit their ability to get enough food, water, and warmth. In order to encourage the ducklings to eat and drink immediately it is recommended to place them next to a food or water source. After the ducklings have settled in, likely 1-2 hours after arrival, walk through and check on the ducklings. The most important thing to look at is their behavior. If ducklings are gathered together under the heater, they are too cold and the heater should be turned up. If they are all around the outer fringes of the pen and gasping, they are too hot and the heater should be turned down. If they gather in only one particular area, it is too draughty and a higher ring barrier should be placed to block the draught. If the birds are roaming around in and out from the heat source, then the conditions are perfect. If the birds have sweaty backs, the humidity is too high and you will need to increase ventilation; if not, this will promote pecking. (See Figure 2 in the Tables and Figures section for a visual guide). Also look for any ducklings that appear weak and struggling. They may need to be moved closer to the brooder or to water if you suspect they have not drank yet. This is especially important for Muscovy ducks as their renal system is still under developed, thus require more water. Ducklings should be checked on 2-3 times a day. During this time, feed and water should be replenished, behavior

evaluated, and any dead ducklings removed. If the ducklings had a very long or difficult trip from the hatcher, you may need to check on them hourly for the first day or two.

### *Week 2*

Brooder temperature can be reduced by 2-3 degrees. Ring barriers can be removed, but ducklings should not have full barn access yet. If the ambient temperature is about 29-32°C, brooders can be turned off during the day, but turned on at night. Continue to monitor and check on the birds daily. It may be necessary to add dry litter and/or remove wet litter especially around water dispensers.

At this time ducklings may start to develop adult feathers, this period has the highest risk for feather pecking. If feather pecking starts, give the ducks more space and consider adding enrichment devices. Ducks are very attracted to blue and green colored items.

Granite chick grit may be added to the feed or given separately, especially if silage is also available to the ducklings.

### *Week 3-5*

If still needed, the brooder temperature can be reduced again by 2-3 degrees. If ambient temperature is about 26-29°C during the day and night, then brooders can be turned off and removed. If not, then brooders should be on at least during the night. If raising ducklings in cold weather, the brooder may be needed until week 5. Once brooders are removed, the ducklings can be given full access to the barn.

If raising ducklings free-range in a mobile house, they can be allowed outside for a few hours a day during the afternoon weather permitted until mostly feathered. Ducklings should not be given access to swimming area until mostly feathered. For ducks this should occur around week 3 or 4, for Muscovy ducks this may not occur until week 6 or 7.

The diet should be changed from a starter diet to a grower diet during this period.

### *Week 5-slaughter*

If using nipple drinkers, raise the drinkers occasionally as the birds grow such that their neck is nearly fully extended to reach it. Any barrier below the nipple, such as a catch cup should be removed.

Feeders should also be raised as the birds grow and the litter floor rises.

Fresh litter should be placed regularly to ensure the floor is sufficiently clean and dry to reduce the occurrence of disease.

Ducks should be allowed outside all day and in the swimming area.

### *3 weeks before slaughter*

If ducks will be transported off site to a slaughter facility via plastic crates, it is recommended to add 40 mg/kg of Zinc Methionine, 50 mg/kg of Vitamin K and 5 mg/kg of Vitamin E to the feed or water to reduce bruising.

### *Slaughter*

The minimum slaughter age is 49 days for Peking ducks, 70 days for female Muscovy ducks, 84 days for male Muscovy ducks, and 92 for Mallard ducks. The goal weight at slaughter is about 3-3.5 kg for all breeds. Feed should be withheld for 24 hours before slaughter to reduce gut fill, but water should still be provided.

If you are slaughtering the birds yourself, you may want to wait until the birds start their first molt. This is because waterfowl have pinfeathers that are more difficult to remove than turkey or chicken feathers. But when the bird is molting, the feathers are ready to fall out, thus making them easier to remove at slaughter. Peking ducks molt at 8 weeks and 16 weeks of age. Mallards and Muscovy ducks will start to molt at about 10-12 weeks of age, but this may vary by gender and seasonality.

### *After slaughter*

After the birds are removed for slaughter, the barn should be cleaned and prepped for the next batch. This involves complete removal of any litter, cleaning and disinfecting the barn. Feeders should also be cleaned out of old feed and drinkers flushed and disinfected. The pastures and run areas should be allowed to rest and may need re-seeded to allow for enough vegetative cover to return. If raising free-range ducks, the pastures used should rest between batches and rotated at least every 2 batches. Soil in these pastures and runs can be treated with lime before allowing to resting for a year to reduce the parasitic load in the soil

### *Breeding*

Ducks will start laying eggs at 20-24 weeks of age, and will lay for 40 weeks. Muscovy ducks may not start laying until 28 weeks. Pekin ducks will lay 150-200 eggs per year, Mallards will lay about 60-120 eggs per year, and Muscovy's will lay up to 180 eggs per year. Larger breeds like Muscovy's need 1 drake per 5 ducks, whereas lighter breeds, such as Mallards, only need 1 drake per 10 ducks. Artificial insemination is not commonly used in duck production, but can be used to cross Muscovy ducks with Pekin ducks for improved meat production. However since Muscovy ducks are their own species, the resultant offspring of the cross will be sterile (mule ducks). Pekin ducks have a fertility rate of about 80% and a hatchability rate of about 60%. Muscovy's have a fertility rate of about 85% and a hatchability of about 55%. Muscovy duck eggs are incubated for 35 days, and all other duck breeds are incubated for 28 days. While water is not a requirement for ducks to mate, it may improve their fertility and encourage more frequent mating sessions.

### *Egg production*

Duck eggs are the most popular egg after chicken eggs. Desired for their higher fat content and richer flavor, they are the preferred egg in many cultures and high end restaurants. Historically, Khaki

Campbell ducks are considered the best egg layers. But since their reign in the 1950's, several other layer breeds have been developed internationally and locally. Today, a good laying duck should produce 200-300 eggs per year and are more profitable than chicken eggs due to their similar costs but higher egg price. Muscovy's are not recommended for egg production. A strict diet to prevent ducks from over conditioning and a good lighting program is needed to maximize egg production. Males are not needed for ducks to lay unfertilized eggs for sale.

### *Disease management*

#### Salmonella

Salmonella is a bacterial infection that can affect poultry and humans consuming undercooked poultry products. Salmonella can be passed to ducklings if their eggs have been contaminated by their mother or equipment used. In young ducklings symptoms of salmonella include anorexia, weakness, ruffled feathers, diarrhea, dyspnea, eye inflammation, torsion of the neck, and mortality. Treatment includes giving antibiotics, or culling the whole herd and disinfecting any equipment the birds may have contacted. Avoid mixing flocks or allowing your flock to come into contact with chickens or other birds. Practice strong biosecurity.

Salmonella is a large consumer concern especially in the sale of duck eggs. Salmonella outbreaks do occur in the duck industry and have become more frequent as more people are raising ducks for personal use and commercially. It is recommended that ducks used for egg production or breeding receive the same salmonella vaccination program used in chicken production. Provided your ducklings come from a vaccinated breeder stock, Salmonella is less of a concern for ducks raised for meat production, thus a vaccination program may not be necessary. Consult with your vet about if a Salmonella vaccination program is needed for your operation and what that program should be.

#### Eye problems

Crusting, unnatural color, and other abnormal eye symptoms are often associated with high ammonia levels in your barn. If this occurs, increase your barns ventilation and put down fresh litter. If you can still smell ammonia, then add iron sulfate to the litter as this will bind with the ammonia before it volatilizes into gas. Eye problems can also be associated with a dusty environment.

#### Angel wing/slipped wing/drooped wing

This condition occurs in the one or both wings and is due to feeding a diet too high in protein and energy. This is more common in slow growing breeds (Mallards) than fast growing ones (Peking). This issue is characterized by the twisting of the last joint of the wing causing the feathers to point out instead of laying flat against the body. If this occurs, change the feed to a lower protein and energy blend or restrict feed intake of concentrates and do not feed protein rich forages such as alfalfa. The twisted wing may develop properly if placed in a sling, but this may be impractical in a commercial operation. Thus any birds that do not grow out of it after changing the diet should be euthanized.

#### Duck Virus Hepatitis

This virus only effects ducklings under 4 weeks of age and will spread quickly through a flock causing up to 90% mortality rate. Infected ducklings will have spastic leg contractions followed by death with in an hour. Dead ducklings will be in a backward arched position. Prevention involves isolating young ducklings from older ducks and to vaccinate breeding stock.

#### Duck Plague (Duck Virus Enteritis)

Caused by a herpes virus, this disease mostly affects mature ducks, but can also affect young ducks. Symptoms include sluggishness, ruffled feathers, green-yellow diarrhea that may be bloody. Dead birds may have blood-stained feathers around the vent and blood dripping from the nose. There is no treatment for effected ducks. Prevention involves regular immunization of breeder stock.

#### New Duck disease/ Anatipestifer Infection

This bacterial disease results in high mortality, weight loss, listlessness, eye discharge and diarrhea. Ducks may also have strange behavior such as shaking of the head, twisted neck, and lying on their backs paddling their legs. Antibiotics can be given to reduce mortality. Future ducks and uninfected stock should be vaccinated to prevent spread.

#### Aspergillosis

\*See Turkey section. Occurs less frequently in ducks than in turkeys or chickens

#### Botulism

This toxin produced by the *Clostridium botulinum* bacterium grows in stagnant ponds and other areas where decaying organic matter is present. Consumption of the toxin by the ducks causes a progressive limp paralysis of the neck, legs, and wings. Affected ducks typically die in a coma with in 1-2 days. If this occurs, ducks should be removed from the suspected source and a vet called in.

#### Predation

Due to their small size and well mannered nature, ducks, especially ducklings, are highly susceptible to predation. Ravens and seagulls are known to attack ducks and kill them during the day. Foxes, badgers, and other predators may attack ducks at night. A free-range duck farm in the UK estimates they have about 2% duck loss due to predation. Therefore it is important to bring ducks inside at night, and to have their outside area fenced in with an electric fence.

#### *Feed tables/recommendations*

TABLE 5-1 Nutrient Requirements of White Pekin Ducks as Percentages or Units per Kilogram of Diet (90 percent dry matter)

Nutrient	Unit	0 to 2 Weeks; 2,900 <sup>a</sup>	2 to 7 Weeks; 3,000 <sup>a</sup>	Breeding; 2,900 <sup>a</sup>
Protein and amino acids				
Protein	%	<b>22</b>	16	<b>15</b>
Arginine	%	<b>1.1</b>	<b>1.0</b>	
Isoleucine	%	<b>0.63</b>	<b>0.46</b>	<b>0.38</b>
Leucine	%	<b>1.26</b>	<b>0.91</b>	<b>0.76</b>
Lysine	%	<b>0.90</b>	<b>0.65</b>	<b>0.60</b>
Methionine	%	0.40	<b>0.30</b>	<b>0.27</b>
Methionine + cystine	%	0.70	0.55	<b>0.50</b>
Tryptophan	%	<b>0.23</b>	<b>0.17</b>	<b>0.14</b>
Valine	%	<b>0.78</b>	<b>0.56</b>	<b>0.47</b>
Macrominerals				
Calcium	%	<b>0.65</b>	<b>0.60</b>	2.75
Chloride	%	0.12	<b>0.12</b>	<b>0.12</b>
Magnesium	mg	<b>500</b>	<b>500</b>	<b>500</b>
Nonphytate phosphorus	%	<b>0.40</b>	<b>0.30</b>	
Sodium	%	0.15	<b>0.15</b>	<b>0.15</b>
Trace minerals				
Manganese	mg	<b>50</b>	? <sup>b</sup>	?
Selenium	mg	0.20	?	?
Zinc	mg	<b>60</b>	?	?
Fat soluble vitamins				
A	IU	<b>2,500</b>	<b>2,500</b>	<b>4,000</b>
D <sub>3</sub>	IU	<b>400</b>	<b>400</b>	<b>900</b>
E	IU	<b>10</b>	<b>10</b>	<b>10</b>
K	mg	<b>0.5</b>	<b>0.5</b>	<b>0.5</b>
Water soluble vitamins				
Niacin	mg	<b>55</b>	<b>55</b>	<b>55</b>
Pantothenic acid	mg	<b>11.0</b>	<b>11.0</b>	<b>11.0</b>
Pyridoxine	mg	<b>2.5</b>	<b>2.5</b>	<b>3.0</b>
Riboflavin	mg	<b>4.0</b>	<b>4.0</b>	<b>4.0</b>

NOTE: For nutrients not listed or those for which no values are given, see requirements of broiler chickens (Table 2-5) as a guide. Where experimental data are lacking, values typeset in bold italics represent an estimate based on values obtained for other ages or species.

<sup>a</sup> These are typical dietary energy concentrations as expressed in kcal ME<sub>n</sub>/kg diet.

<sup>b</sup> Question marks indicate that no estimates are available.

Ducks are sensitive to toxins such as aflatoxin; therefore moldy grain should never be given. To avoid calcium toxicity (Ca>2%) granite based and not oyster shell based grit should be used. Ducks should never be given rapeseed meal from older varieties that contain erucic acid and goitrogens.

## Geese

### *Introduction/market strategy*

Christmas goose was an honored tradition in most of Europe, and still is many people. However, with the increased popularity and availability of turkey, turkey has become the predominant roasting poultry for the holidays. Geese have also received a bad reputation due to the welfare concerns surrounding *foie gras* production. Goose is still seen as a luxury or specialty product; therefore customers and restaurants are willing to pay more for quality.

### *Getting started*



Before the goslings arrive, several decisions and preparations need to be made first.

### Housing

If you do not have a poultry barn already or would like to raise your geese completely free range, some kind of shelter or mobile barn is still needed for the first 2 weeks. This shelter does not need to have a floor provided it is not muddy, but does need a roof and protection to wind as young goslings are very sensitive to temperature.

If you already have a poultry barn you would like to use, first ensure that it meets the økologisk requirements. A økologisk poultry barn cannot be larger than 1,600 m<sup>2</sup> of useable space, and must have exit and entry holes large enough for geese with a combined length of at least 4m per 100 m<sup>2</sup>, have natural lighting, and at least one third of floor space is solid (not slated or gird) with litter of straw, wood shavings, sand, or turf. If your poultry barn is already approved for økologisk broiler production, then taller entry and exit holes should be sufficient changes to meet requirements for geese. Geese do not naturally roost and therefore will not use perches if provided and are not required for production. While not required, it is recommended to use Pekino cup drinkers instead of nipple drinkers for geese. This allows geese to fully submerge their head when drinking and wet their feathers enough for preening.

For økologisk production, it is required that birds have access to the outdoors for at least one third of their life. As such, fenced in outdoor runs will need to be constructed large enough for each goose to have 15 m<sup>2</sup> of outdoor space. If raising geese completely on pasture, then more outdoor space may be needed than 15 m<sup>2</sup> per bird. The outdoor area must contain open air and vegetative cover. Since geese are waterfowl, the outdoor area must contain a stream, pond, lake, or pool.

### Stocking rate

EU økologisk legislation limits each poultry house to 2,500 geese at one time. Regardless, producers still need to be below the 170 kg N per yr per ha limit.

### Preparations for arrival of goslings

For production in a poultry house, part of the floor space should be selected and sectioned off for the brooding phase. In this section, about 5 cm of litter should be placed to effectively cover the floor. Rings constructed from wood boards, straw bales, or plastic rings should be placed on the floor with a brooder in the center. The barriers should be about 1 m tall and should be placed such that no sharp corners are formed. Young goslings will often get stuck in corners and will not be able to find feed or water. Read the directions for your specific brooder to determine the max size of the ring, and the number of goslings per brooder. If number of goslings per brooder is not on directions, use 1/3 of the recommendation of chicks. The brooder should be hung about 45 cm from the floor, unless specified on brooder directions. Feed and water should be placed inside the ring, but not directly under the brooder. Small cup water dispensers designed for chicks should be used with about 1 for every 25 goslings is needed. The open water should encourage the goslings to drink. Be aware that the goslings will likely try and play in the water. Thus to reduce the mess and keep the litter dry longer, it is recommended to

place the waters on a 2 cm wire mesh platform to keep the spilled water out of reach. If using a tray of water, the mesh can be placed on top to prevent swimming and playing in water. Starter feed should also be placed on several open flat pans to attract the birds to the feed and encourage consumption. The number of feed pans needed depends on the number of goslings and the size of the pan. (See Figure 1 in the Tables and Figures section for a visual guide). Goose or waterfowl starter feed should be used. It is not recommended to use chicken starter feed for goslings as this is too high in protein and has a very different balance of vitamins and minerals. If gosling starter feed cannot be found, you should consider making your own, or consult a nutritionist on how to adjust a chicken starter feed to work for your goslings.

For an outdoor mobile house, litter is not needed if the building does not contain a floor, provided it is not muddy. A brooding ring should also be constructed like in the poultry house, but a brooder may not be necessary if the weather is at least 36°C day and night.

About 24 hours before the goslings arrive, brooders should be turned on and set to 36-37°C to ensure the barn is warm enough by the time they arrive. At this time feed, and water should be checked and ensure that everything is set up properly for their arrival.

#### *Week 1*

When the goslings arrive, quickly and carefully place them into a brooder ring. Be sure not to place too many goslings in a ring as this may limit their ability to get enough food, water, and warmth. In order to encourage the goslings to eat and drink immediately, it is recommended to place them next to a food or water source. After the goslings have settled in, likely 1-2 hours after arrival, walk through and check on them. The most important thing to look at is their behavior. If goslings are gathered together under the heater, they are too cold and the heater should be turned up. If they are all around the outer fringes of the pen and gasping, they are too hot and the heater should be turned down. If they gather in only one particular area, it is too draughty and a higher ring barrier should be placed to block the draught. If the birds are roaming around in and out from the heat source, then the conditions are perfect. If the birds have sweaty backs, the humidity is too high and you will need to increase ventilation; if not, this will promote pecking. (See Figure 2 in the Tables and Figures section for a visual guide). Also look for any goslings that appear weak and struggling. They may need to be moved closer to the brooder or to water if you suspect they have not drank yet. Goslings should be checked on 2-3 times a day. During this time, feed and water should be replenished, behavior evaluated, and any dead goslings removed. If the goslings had a very long or difficult trip from the hatchery, you may need to check on them hourly for the first day or two.

Goslings can be given forage starting a few days of age. When you start giving forage, you should also provide granite chick grit.

#### *Week 2*

Brooder temperature can be reduced to 32-33°C. Ring barriers can be removed, but goslings should not have full barn access yet. If the ambient temperature is about 32°C, brooders can be turned off during

the day, but turned on at night. Continue to monitor and check on the birds daily. It may be necessary to add dry litter and/or remove wet litter especially around water dispensers.

### *Week 3*

Brooder temperature can be reduced to 23-25°C. If the ambient temperature is at least 23°C day and night then brooders can be turned off and removed. Goslings can now be given full barn access. During this week goslings should start to develop pin feathers starting at the ends of the wings and tail.

If raising the birds free-range, they can be given access outside during the day, but should not be allowed to swim until their feathers are further developed.

Continue to monitor and check on the birds daily. It may be necessary to add dry litter and/or remove wet litter especially around water dispensers.

### *Week 4*

Brooders can be turned off and removed. No additional heat is needed unless the ambient temperature inside is below 20°C.

Continue to monitor and check on the birds daily. It may be necessary to add dry litter and/or remove wet litter especially around water dispensers. Feeders and water dispenser height will need to be adjusted as the birds grow.

### *Week 5*

The diet can be changed from the starter diet to a grower diet. Small feathers should cover most of the body except for the head and the feathers will continue to grow and fill in.

If raising the birds free-range in the summer, the birds can now be given access to the swimming area provided it is warm outside.

### *Week 6-7*

Feathers should be almost done filling in. Depending on the weather, birds can be given access to the outdoors and swimming area.

### *Week 7-16*

Continue to monitor and check on the birds daily. It may be necessary to add dry litter and/or remove wet litter especially around water dispensers. Feeders and water dispenser height will need to be adjusted as the birds grow.

### *Week 17-20*

If geese will be transported off site to a slaughter facility via plastic crates, it is recommended to add 40 mg/kg of Zinc Methionine, 50 mg/kg of Vitamin K and 5 mg/kg of Vitamin E to the feed or water to reduce bruising. This should be done starting 3 weeks before slaughter.

### *Slaughter*

The minimum slaughter age for geese is 140 days at a weight of 6-7 kg. Feed should be withheld for 24 hours before slaughter to reduce gut fill, but water should still be provided.

As waterfowl, geese have pin feathers that are difficult to pluck at slaughter. So if you are doing the slaughtering yourself it is recommended to wait until the geese start to molt if possible. However when your geese will start to molt depends on their age, breed, and season.

### *After slaughter*

After the birds are removed for slaughter, the barn should clean and prepped for the next batch. This involves complete removal of any litter, cleaning, and disinfecting the barn. Feeders should also be cleaned out of old feed and drinkers flushed and disinfected. The pastures and run areas should be allowed to rest and may need re-seeded to allow for enough vegetative cover to return. If raising free-range geese, the pastures used should rest between batches and rotated at least every 2 batches. Soil in these pastures and runs can be treated with lime before resting for a year to reduce the parasitic load in the soil.

### *Breeding*

Geese take a long time to reach sexual maturity and will not start to lay eggs until 40-50 weeks of age, although some farmers don't start mating their geese until 2 years old. A goose can be kept for breeding up to 10 years of age, but ganders should be culled at 6 years old. While a goose may occasionally start laying in the fall, they naturally start to lay in the spring. Once a goose starts laying, she can lay for 20-24 weeks if the eggs are removed regularly. If not removed, she will stop laying after 2 weeks and start incubating her eggs. Most modern geese meat breeds lay 30-60 eggs per year. Since geese are such poor layers, it is not economical to raise geese for egg production.

Geese can be artificially or naturally inseminated. For artificial insemination, geese should be re-inseminated every 6 days, and 1 gander is needed per 12 females. If going the natural route, you will need 1 gander per 4-5 geese. For geese, fertility is usually less than 70% and hatchability at 28-35 days, depending on the breed, is just over 80% using modern incubators. As such, about 60% of laid eggs will successfully produce goslings. Since geese prefer to mate on water, having access to water deep enough to swim in will likely increase fertility rate. Geese also prefer to mate for life, so ganders should mate to the same females every year.

### *Disease management*

Geese are more hardy and resistant to diseases than most domesticated poultry species. However, that does not mean your flock is completely immune. There are still several common poultry diseases that can affect your flock.

### Coccidiosis

While geese can get two different types of coccidiosis, the level of infection and mortality rate is much lower than for other poultry species. Renal coccidiosis can affect geese from 3-12 weeks of age, and can have a mortality rate up to 80%. Symptoms include depression, weakness, diarrhea, white feces, anorexia, dull sunken eyes, and drooped wings. Intestinal coccidiosis mostly effects young birds, and rarely results in mortality. Symptoms include anorexia, tottering gait, diarrhea, and morbidity. Coccidiostats can be given to geese to keep the infection rate under control if symptoms are persistent or spreading.

### Cryptosporidiosis

This protozoa infects the lungs and intestine of geese and has been increasing number of reports world-wide in geese, but high mortality rates are only seen in young geese. Symptoms include depression, sneezing, general respiratory distress, and diarrhea. There is not treatment or preventative medication. But once the birds recover they are immune. Therefore good sanitation and biosecurity is important.

### Parvovirus

Also known as Derzy disease, Goose Plague, Goose Hepatitis, Goose Enteritis, Good Influenza, Infectious Myocarditis, or Ascetic Hepatonephritis, this is a very contagious disease that affects young geese. If infected during the first week of life, the mortality can be up to 100%, but if over 4-5 weeks of age, mortality rate will be negligible. Symptoms include anorexia, polydipsia, and weakness with a reluctance to move, nasal and ocular discharge, swollen and red uropygial glands and eyelids, and a profuse white diarrhea. There is no treatment. Goslings from mothers, who have had the infection or the vaccination, will pass a passive immunity to their offspring for the first 2-3 weeks of life.

### Mycoplasma Infections

The occurrence of mycoplasma infections in birds has increased in the past few years, especially in northern European countries such as Denmark. This infection is most problematic in intensive production systems. Young geese may be exposed to this infection from the hatching egg, especially if their mother has it. Thus, it is important to get your gosling from a good breeder. If a breeder flock is infected, eggs should be dipped in tylosin solution before incubation. Symptoms in goslings includes reduced growth, and respiratory and air sac infections. Goslings can be treated by adding tetracycline or tylosin to their drinking water.

### Nematodes

For geese, *Ascaridia* are generally not a problem but various species of *Capillaria* and *Heterakis* can cause problems. Typically geese become lethargic when experiencing a worm infection. Testing of the

feces or an autopsy is needed to confirm infection and determine treatment plan. To control worm levels on your farm, rotate pastures 3-4 times a year and rest pastures for a year in between to break the cycle of reinfection. Do not mix geese of different ages, and be very cautious when introducing new geese to your flock.

#### Salmonellosis/Paratyphoid

Geese under 6 weeks of age are the most susceptible and can be infected from contaminated equipment or even while still in the egg. Goslings with salmonellosis will stand in one position with their heads bowed, eyes closed, wings dropped, and feathers ruffled. Other symptoms include anorexia, increased water intake, diarrhea, pasty vent, and tendency to huddle near heat sources. When an outbreak occurs, all possible sources need to be removed and any eggs produced should be fumigated. Affected birds should be treated appropriately with the help of a vet. Rodent control is also important in controlling the spread or preventing an outbreak of salmonellosis.

#### Riemerella Anatipestifer Infection

This contagious disease affects ducks and geese. Symptoms include discharge from eyes and nose, coughing and sneezing, green diarrhea, uncoordinated movement, tremor in neck and head, and a coma. Geese that survive this infection are then immune to this infection. There is a vaccine for ducks and can potentially be used for geese as well.

#### Aspergillosis

\*see turkey section. Occurs less frequently in geese than in turkeys or chickens.

#### Predation

Geese are typically very aggressive, and thus often scare off or attack predators. Because of this they are often used as guard animals for other animal species. However, young goslings are susceptible to predation and should not be left outside at night. Geese should still be in a fenced in area for further protection and prevention.

#### *Pest and weed management*

Geese are excellent foragers and can obtain up to 60% of their diet from foraging. However the more focus geese put on foraging, the slower their growth is. Geese have been used to sustainably manage weeds and pests in asparagus, potato, fruit shrubs, nursery stock, tobacco, nut trees, grape, fruit trees, beet, bean, hop, various ornamental flower, cotton, onion and strawberry production. 5-6 geese can manage 1 ha of cotton production efficiently. Geese raised for weed management should not be given high quality forages, but low quality (but not moldy) grasses and weeds. If there is a particular weed that is problematic and you want the geese to eat you should give them the weeds when they are goslings as their forage. When the goslings are old enough to be let out, they will then seek out this weed when foraging. In this way geese have been very effective at controlling weeds and invasive crops, most notably water hyacinth. In order to encourage foraging, concentrates should be restricted. However,

over restriction of concentrates without enough weeds to forage will lead geese to start eating the main crop.

### *Feed tables/ feeding recommendations*

TABLE 4-1 Nutrient Requirements of Geese as Percentages or Units per Kilogram of Diet (90 percent dry matter)

Nutrients	Unit	0 to 4 Weeks; 2,900 <sup>a</sup>	After 4 Weeks; 3,000 <sup>a</sup>	Breeding; 2,900 <sup>a</sup>
Protein and amino acids				
Protein	%	<b>20</b>	<b>15</b>	<b>15</b>
Lysine	%	1.0	0.85	<b>0.6</b>
Methionine + cystine	%	0.60	0.50	<b>0.50</b>
Macrominerals				
Calcium	%	<b>0.65</b>	<b>0.60</b>	<b>2.25</b>
Nonphytate phosphorus	%	<b>0.30</b>	<b>0.3</b>	<b>0.3</b>
Fat soluble vitamins				
A	IU	<b>1,500</b>	<b>1,500</b>	<b>4,000</b>
D <sub>3</sub>	IU	<b>200</b>	<b>200</b>	<b>200</b>
Water soluble vitamins				
Choline	mg	<b>1,500</b>	<b>1,000</b>	?
Niacin	mg	<b>65.0</b>	<b>35.0</b>	<b>20.0</b>
Pantothenic acid	mg	<b>15.0</b>	<b>10.0</b>	<b>10.0</b>
Riboflavin	mg	3.8	2.5	<b>4.0</b>

NOTE: For nutrients not listed or those for which no values are given, see requirements of chickens (Table 2-5) as a guide. Where experimental data are lacking, values typeset in bold italic represent an estimate based on values obtained for other ages or species.

<sup>a</sup> These are typical dietary energy concentrations expressed in kcal ME<sub>n</sub>/kg diet.

Note: like most poultry, geese are susceptible to fungi that produce mycotoxins such as aflatoxins. Therefore, you should never feed geese contaminated grain. Thus, feed should be purchased from a reputable feed mill that tests all of their grain coming into the facility. If you feed your geese your own grain, you should have it tested after every harvest before feeding to your geese, especially if you had a wet season or harvested the grain wet as this increase the chance of a mycotoxin producing fungal infection.

### **Conclusion**

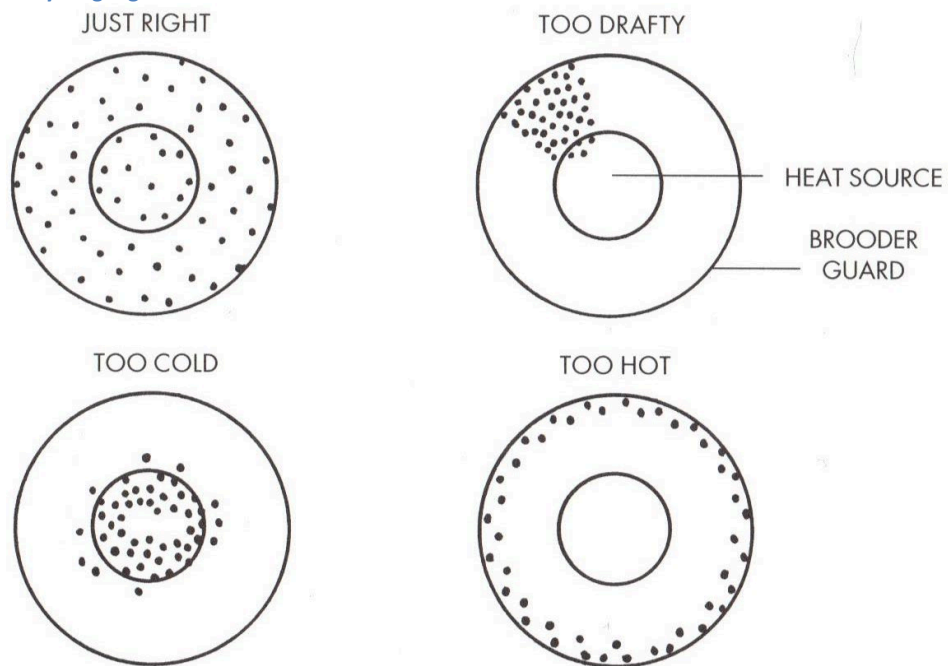
With both the introduction and popularity of international cuisine to Denmark and the push for unique quality food has increased the demand for økologisk turkey, duck, and goose products. Therefore, producers are needed to meet this rising demand. You can start by doing a rotation of turkeys, ducks, or geese in place of your normal chicken production, in time for the seasonal holiday market. Or add one of these species to you operation along side the standard chicken production. Either way, the økologisk production of turkeys, ducks, and geese has the potential to be a very profitable endeavor.

### **Tables and Figures**

Figure 1: Brooder set up



Figure 2: Body language and brooder heat





MINIMUM NUTRIENT REQUIREMENTS FOR DUCK AND GOOSE FEED							
TYPE OF BIRD		DUCK & GOOSE	DUCK & GOOSE	DUCK	GOOSE	GOOSE	DUCK & GOOSE
TYPE OF FEED		STARTER	GROWER	LAYER	LAYER	HI-GAIN	MAINTENANCE
FORM		Crumble	Crumble	Pellet	Pellet	Pellet	Pellet
LIFE STAGE		0-3 Weeks	3 Weeks-First Egg	During Egg Production	During Egg Production	Geese for Processing	Between Laying Seasons
Metabolizable Energy	Kcal/kg	2920	3010	2740	2740	3000	2700
Crude Protein	%	At least 20	17.5-19	17.5	15.5	16	14.5-16
Crude Fat	%	4	4	5	4	5.8	4
Linoleic Acid	%	1	1	1.5	1	0.7	1
Crude Fiber	%	4	5	5	5	5.5	6
MINERALS							
Potassium	%	0.83	0.80	0.80	0.80	0.40	0.40
Calcium	%	1.00	0.90	3.00	2.50	0.75	0.90
Available Phosphorus	%	0.40	0.35	0.40	0.30	0.30	0.35
Magnesium	%	0.05	0.05	0.05	0.05	0.05	0.05
Sodium	%	0.14	0.14	0.14	0.14	0.14	0.14
Chloride	%	0.16	0.16	0.16	0.12	0.12	0.12
Iron	mg/kg	80.00	60.00	60.00	30.00	20.00	50.00
Manganese	mg/kg	50.00	60.00	60.00	70.00	60.00	60.00
Copper	mg/kg	8.00	8.00	8.00	3.00	1.50	6.00
Zinc	mg/kg	60.00	65.00	65.00	70.00	60 (100)*	40.00
Iodine	mg/kg	0.40	0.40	0.40	0.60	0.60	0.40
Selenium	mg/kg	0.20	0.20	0.20	0.11	0.11	0.11

AMINO ACIDS							
Arginine	%	0.94	1.00	0.60	0.60	0.65	0.50
Histidine	%	0.42	0.29	0.30	0.30	0.22	0.20
Isoleucine	%	0.63	0.46	0.38	0.50	0.50	0.40
Leucine	%	1.26	0.91	0.76	0.50	0.85	0.50
Lysine	%	1.16	0.90	0.94	0.80	0.70	0.70
TSAA (Met+Cys)	%	0.76	0.77	0.80	0.60	0.55	0.60
Threonine	%	0.84	0.66	0.60	0.50	0.50	0.45
Tryptophan	%	0.21	0.20	0.18	0.19	0.17	0.16
Valine	%	0.77	0.56	0.47	0.58	0.65	0.50
VITAMINS							
Vitamin A	KIU/kg	15	15	15	12	4	12
Vitamin D	KIU/kg	3	3	3	2.5	0.6	2
Vitamin E	IU/kg	20	20	20	15	7**	20
Vitamin K	mg/kg	1.75	1.5	1	0.4	0.4**	0.4
Biotin	mg/kg	0.25	0.2	0.2	0.4	0.25	0.15
Choline	mg/kg	1600	1400	1000	500	500	500
Folic Acid	mg/kg	1	1	1	2	0.6	0.85
Niacin	mg/kg	55	55	55	40	25	40
Pantothenic Acid	mg/kg	11	11	11	10	7	10
Thiamine (Vit. B-1)	mg/kg	2	2	2	2	1.5	2
Riboflavin (Vit. B-2)	mg/kg	4	4	4	3	2.5	3
Pyridoxine (Vit. B-6)	mg/kg	2.5	2.5	3	4	2	4
Vitamin B-12	mg/kg	0.01	0.01	0.01	0.01	0.01	0.01

\*\*We suggest you add 40 mg/kg of Zinc Methionine and increase Vitamin K to 50 mg/kg and Vitamin E to 5.0 mg/kg for the last three to four weeks before processing to help prevent bruising – especially if your birds will be transported in coops to the plant.

### Nutritional Comparison Between Duck Eggs & Chicken Eggs

	Duck	Chicken
Water, grams	74.57	70.83
Kcal	185	158
Protein, grams	12.81	12.14
Lipids, grams	13.77	11.15
Minerals (in milligrams)		
Calcium	64	56
Iron	3.85	2.09
Magnesium	16	12
Phosphorus	220	180
Potassium	222	130
Sodium	146	138
Zinc	1.41	1.44
Lipids		
Total Saturated, grams	3.68	3.35
Total Monounsaturated, grams	6.52	4.46
Total Polyunsaturated, grams	1.22	1.45
Cholesterol, mg	884	548

	Duck	Chicken
Vitamins		
Thiamin, mg	.156	.087
Riboflavin, mg	.404	.301
Niacin, mg	.200	.062
B6, mg	.250	.120
B12, mg	5.395	1.547
A, IU	1328	520
Amino Acids, in grams		
Lysine	.951	.820
Methionine	.576	.392
Cystine	.285	.289
Threonine	.736	.596
Isoleucine	.598	.759
Phenylalanine	.840	.686

The following is excerpted from "Properties and Food Uses of Duck Eggs" by Rhodes, Adams, Bennett and Feeney of the University of Nebraska, 1960.