giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

FiBL

African Organic Agriculture Training Manual

A Resource Manual for Trainers

ORGANIC POULTRY PRODUCTION

Version 1.0
October 2022

IMPRINT

Publisher:
Research Institute of Organic Agriculture FiBL
www.fibl.org

Responsible authors:
Christine Brenninkmeyer, Selina Ulmann,
Elsa Kanner, Nele Quander, Veronika Maurer (FiBL)

Contributors:
Christiane Keppler, Mareike Voigts, Sisay Girma

Editing:
Elsa Kanner, Gilles Weidmann (FiBL)

Illustrator: Deogratius Okudi (Uganda)

FiBL item no. 1578

DOI 10.5281/zenodo.7214940

Version 1.0, October 2022.

The manual is intended for use by trainers during the training of farmers on organic poultry production.

Comments and recommendations for improvement to this version are welcome.

The manual was produced by the Research Institute of Organic Agriculture FiBL and developed for the Knowledge Centres for Organic Agriculture (KCOA) in Africa implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) on behalf of the Federal Ministry for Economic Cooperation and Development (BMZ) of Germany.

CONTENTS

10-03 POULTRY

SET OF TRANSPARENCIES

How to use this Manual

This manual is intended for use by trainers of trainers and trainers of farmers on organic agriculture. The manual aims to explain the principles and details of poultry management for small-scale poultry farmers in Africa under organic management. It has been developed with the understanding that farmers live in various contexts that may require unique adaptations of these guidelines.

Users may require further references to existing training materials for more information:

- Africa organic agriculture training manual Module nr. 1: Definition and Benefits of Organic Agriculture.
- Africa organic agriculture training manual Module nr. 5: Animal Husbandry
- African organic agriculture training manual Module nr. 8: Conversion to Organic Farming

1. Introduction

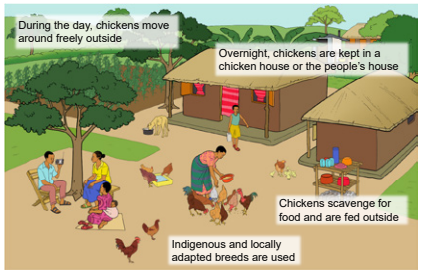
1.1 Background

Poultry products (meat and eggs) play an important role for the nutrition of the human population as a whole, and in Africa in particular. Demand for these products in Africa is high, and is expected to increase significantly in the next 20 years (FAO, 2017).

The poultry industry in Africa has been growing rapidly over the past 10 years in response to this demand, particularly in countries like South Africa, Kenya, Rwanda, Tanzania, Uganda, and others. So far, the industry has been very successful with about 80 % of the poultry meat consumed in Africa being produced domestically (FAO, 2021). Small-scale rural and indigenous chicken production makes up a significant portion of this production, comprising 70 % of the total chicken production in Sub-Saharan Africa.

TRADITIONAL FREE-RANGE POULTRY PRODUCTION

Traditional free-range poultry production



African Organic Agriculture Training Manual Animal Species M10: Poultry Husbandry U3 1

ADVANTAGES AND DISADVANTAGES OF TRADITIONAL POULTRY PRODUCTION

Traditional free-range poultry production

Advantages:
- Low feed costs: Chickens find most of their feed by scavenging
- Natural behaviour
- Natural reproduction

Disadvantages:
- Risk of predation (higher losses)
- Only possible with a low number of chickens
- Often lack of vaccination (higher losses)

Challenges:
- Vaccination of the chicks at the right age

African Organic Agriculture Training Manual Animal Species M10: Poultry Husbandry U3 2

In addition to profits, small-scale poultry production provides valuable nutrition to the most vulnerable populations (children, pregnant women, and nursing mothers) in the form of proteins, vitamins, and micronutrients, while contributing to poverty reduction. It is also an important economic opportunity for smallholder farmers or those without land, particularly for rural youth and women (Melesse, 2014).

However, as demand begins to outstrip domestic production, imports of chicken meat from Europe are increasing. These imports undermine the domestic market and decrease profits for local producers. It is therefore important to strengthen domestic chicken production in Africa, and in particular the small-scale rural and indigenous production systems.

There are many reasons why chicken production is so popular. Firstly, the capital investment in village chicken production is less than for any other livestock species, making them an attractive option for many smallholder farmers. Chickens are small, easy to keep and handle, and have a short production cycle. Further, for smallholder farmers, they can be the most efficient and profitable species to raise. Finally, chickens offer additional benefits such as their nitrogen-rich manure that can be used as a crop fertiliser.

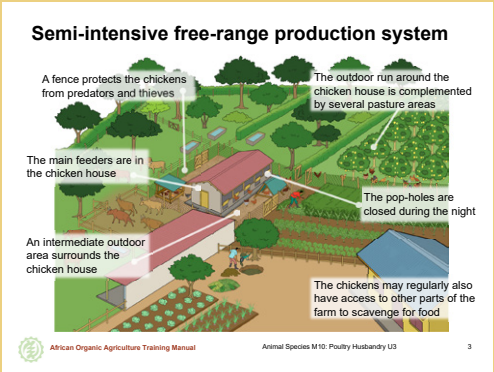
1.2 Poultry production systems in Africa

About 85 % of the households in Sub Saharan Africa keep their chickens in a free-range system. The traditional free-range system and the semi-intensive free-range system are both suitable for organic farming or are more or less easy to convert to organic farming. The intensive system, in which 30 % of the chickens of Africa are kept, does not meet the requirements of organic regulations.

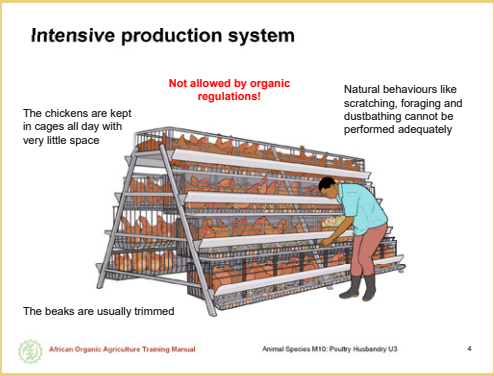
Traditional free-range / village poultry production system

This type of husbandry system is the most common poultry system in Africa, and is suitable for meat and egg production on a small scale. During the day, the animals scavenge freely outside for food. During the night, they might roost outside in trees or bushes, or may be kept inside to provide shelter from predators, rain and cold. This traditional method is good for small numbers of chickens that are primarily used for home consumption with occasional sales. Usually, locally adapted or indigenous chicken breeds are used. Chickens under this type of management have long brood periods, low growth rates, and generally produce

SEMI-INTENSIVE FREE-RANGE PRODUCTION



INTENSIVE PRODUCTION SYSTEM



up to 50 eggs per hen per year. This system is popular because it requires little investment in infrastructure or other inputs that must be purchased (like food).

Semi-intensive free-range production system

The semi-intensive system is a modification of the extensive free-range method. In this system, the chickens still have access to the outdoors, but are also provided with improved housing, fencing to protect them from predators, supplementary feeding, disease prevention measures and medication in times of sickness. This type of system is popular because of the increased yields achieved with a relatively small investment.

Local/indigenous chicken breeds, dual purpose chickens (i. e. a breed where hens are good layers and roosters are good for meat production) and others work best in this type of system (see chapter 6 for further details on chicken types and breeds). Chickens in this system usually have low to medium growth rates, but typically produce more than in the traditional free-range system. Chickens from local/indigenous breeds can produce up to 150 eggs per year, and dual purpose cross-breeds up to 240. High yielding mono purpose hybrids for either egg production (up to 300 eggs per year) or fattening (up to 60 g per day) are challenging in this system, but can be used, if very good management and feeding are provided.

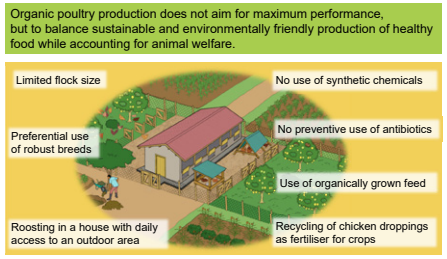
This system is typically used for small flock sizes with 50 to 200 birds, but can be used in larger systems as long as sufficient free-range area in the vicinity of the hen house is available and enough feed can be produced sustainably.

Intensive production system (NOT compatible with organic production)

Although this system can be profitable, it is not compatible with organic production. In an intensive production system, chickens are kept inside the house either in cages or on deep litter, and do not have access to the outdoors. There are usually high stocking rates, and the system puts profits above animal welfare and the environment. The restrictions on natural behaviours, crowded conditions predisposing animals to disease, and the environmental consequences of such operations are some of the reasons why this system is not compatible with organic production.

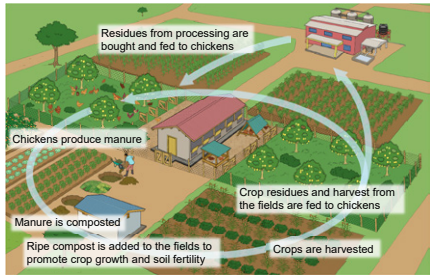
PRINCIPLES OF ORGANIC POULTRY PRODUCTION

Focal points of organic poultry production



INTEGRATION OF POULTRY IN THE FARM

Integrating poultry into the farm cycle



1.3 Organic principles and the benefits of organic poultry production

Organic and conventional poultry production have many similarities, but also some key differences. The focal points of organic poultry production are:

- The animals are kept in a poultry house and have access to an outdoor area during the daytime.
- The animals are fed with organically grown feed.
- There is a preference for breeds which are in general more robust and a little more flexible concerning their feed.
- Flocks are smaller than in conventional production (less than 50 to 3000 chickens).
- No use of synthetic chemicals (like pesticides).
- No preventive use and generally decreased use of medications (like antibiotics or coccidiostatics).
- Organic poultry production does not aim at maximum performance, but keeps the whole farm cycle in view and aims to balance sustainable and environmentally friendly production of healthy food while also accounting for animal welfare.

1.4 Why raise poultry in an organic system?

Given the extra effort and regulations that come with an organic system, why would farmers choose to either begin or convert to this system? Farmers become interested in organic poultry farming for several reasons. Some farmers see the higher prices for organic poultry products (meat and eggs) on the local market, and want to take advantage for their poultry operation. Other farmers want to stop using synthetic chemicals (i.e. pesticides) on their property and in their food for the health of themselves, their families, their customers and the environment. Still others do not have access to synthetic chemicals and medication, and are looking for a way to raise healthy animals for consumption and sale. Finally, some are interested in creating a sustainable and productive farm where expensive inputs like feed and fertiliser do not have to be brought in from the outside. They want to be able to grow cereals and legumes to feed their animals, and use the animal manure as fertiliser or for compost to maintain healthy soils.

Group work and discussion: Gathering information on poultry production systems

Divide the participants into three groups.

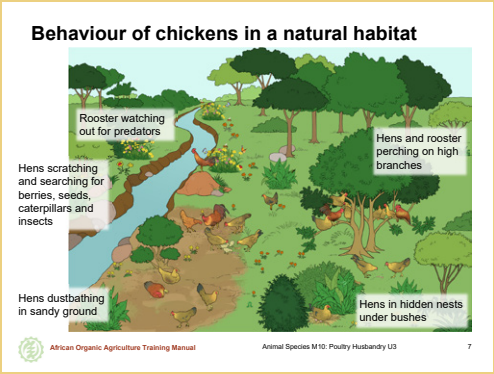
- Intensive production system (non-organic)
- Semi-intensive production system (organic)
- Traditional production system (non-organic)

Ask each group to gather information about their production system and to write the advantages and disadvantages of the system in the local context on a board. Ask the groups to present their findings.

After the presentation of the production systems, discuss the following questions:

- Which system is your favourite and why?
- Which challenges presented are the most important ones to you?
- Which system could you implement on your farm?

BEHAVIOUR IN NATURAL HABITAT



2. Chicken behaviour

2.1 Importance of natural behaviour

Chickens, like other domesticated animals, have a number of natural behaviours. If they are not allowed to show these behaviours, they may suffer from stress and poor health, and may develop behavioural disorders such as feather pecking and cannibalism. This is why animals in an organic system must be kept in such a way that they can demonstrate their natural behaviours. This means that housing systems, feeding, and handling in an organic system are adapted to the needs of the animals. Therefore, it is important to know some details about normal chicken behaviour.

2.2 Natural behaviour of chickens

Social organisation

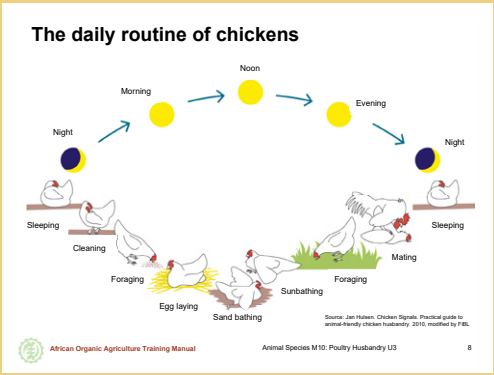
When allowed to practice their natural behaviours, chickens live in small flocks consisting of one or a few roosters and several hens. The chickens know each other individually and they have a hierarchy. One rooster normally has the leading position in the flock. Besides the insemination of the hens the rooster also guides and protects the hens, and may also settle disputes between the hens. Therefore, a few roosters should be integrated into flocks of laying hens even if breeding is not desired. In this case, it is best when the hens and the rooster are raised together or the roosters are older and experienced, as the hens are so superior in number. In this way, they can establish their natural hierarchy. A young rooster introduced later may not be respected by the hens and may be pecked.

Recommendation on roosters: Raise and keep roosters with the flock. As a general guideline, 1 rooster for up to 50 hens is considered suitable. For larger groups, 1 rooster for every 100 hens is appropriate. In case of on-farm breeding, more roosters are needed to inseminate all eggs. In agile breeds 1 rooster for 5 to 15 hens, in heavier breeds 1 rooster for 5 to 10 hens is then needed.

Pecking

Chickens start the day with exploration of their environment and scratching for feed. Under natural conditions, they spend approximately half of the day search-

DAILY ROUTINE



ing for feed and eating. If chickens are confined and unable to perform this behaviour, they will start searching for feed on each other. They will peck each other's feathers, skin, toes or other body parts, which can result in severe injuries or even death. Over time, this will become a learned behaviour, and can cause severe losses in a flock.

Recommendation on scratching material: In semi-intensive systems, straw litter or an equivalent material needs to be added to the housing system to supply the demand of this behaviour.

Nesting

In nature, hens build a nest in a protected place, padded with grass, hay or other soft material. If farmers want the hens to be good layers they should construct nests that fulfil the demands of the hens.

Recommendation on nesting material: Natural nesting conditions can be imitated by constructing nests that are placed in quiet, shadowed places with the bottom covered with soft material like straw, husks, or rubber nubs.

Sheltered foraging

Chickens prefer to forage in a pasture where they can easily find shelter from the weather and protection from predators under trees and shrubs. If no shelter is offered, the animals might not be willing to use the pasture, but instead stay close to their hen house and overuse this area.

Recommendation: To protect existing and/or newly planted shrubs or trees in the pasture area, they can be fenced-in. Covered dustbaths can serve as artificial shelters.

Plumage grooming

Plumage grooming also is an important element of the behavioural repertoire of chickens, and is important for their health and productivity. Chickens care for their feathers while greasing them with the fat of the preen gland. They also care for their feathers by taking a bath in dust and sunbathing. The dust removes old fat and also helps to eliminate parasites (such as mites), and the sunlight reduces

bacteria in the coat. Additionally, the sunlight is essential for the synthesis of Vitamin D which is important for the construction of healthy bones and strong eggs.

Recommendation: Install areas with sand or dry earth and provide access to sunlight in the outdoor pasture. Covered boxes filled with sand provide artificial shelters and dustbaths in one.

Resting

To feel safe when resting and sleeping during the daytime or sleeping during nighttime, chickens look for higher spots (e. g. trees). They also avoid conflicts by moving to a higher or lower perch. Chickens should also have the possibility to satisfy this need inside the hen house.

Recommendation: Install perches with different levels in the henhouse, with enough space for each bird.

If the above-mentioned needs are respected, the free-range (or extensive system) as well as the semi-intensive system can be adapted for organic chicken production.

Group discussion on natural behaviour of poultry

Ask the farmers the following questions and discuss with them the answers:

- What similarities and differences do you see between the natural habitat and the different production systems?
- What benefits can be realised if natural chicken behaviours are understood and respected?
- What challenges can arise if they are not?

3. Housing and outdoor area

3.1 Introduction

A well-constructed chicken house serves several important purposes. It protects the animals from predators such as rats, snakes, and dogs, as well as from theft. It also protects them from harsh weather conditions such as rain, cold, heat or storms, and serves as a place to rest and lay eggs.

The following sections explains how to build a chicken house which allows the animals to show their natural behaviour and improves production. It will also indicate what to pay attention to when designing the outdoor area.

The following aspects are of particular importance for organic poultry housing systems and will be elaborated in the following sections: fresh air, enough space,

clean water and feed, perches, dry litter, nests, sand/dust bath, protection and occupation, and a well-constructed and accessible outdoor area.

3.2 Location and orientation

When choosing a site for a new chicken house, a shady, dry and not too noisy location is best. It should have good water run-off to prevent flooding during heavy rains. Smaller houses (for up to approximately 200 birds) can be raised off the ground on stilts if there is a risk of flooding, and a raised house has the advantage of better protection from predators. Farmers should consider building the chicken house near to the family house so that that animals can be heard at night in the case of predators or thieves. East-west orientation is recommended to minimise exposure of the birds to direct sunlight.

3.3 Types of housing

Open-sided housing

In warm climates, open-sided housing is recommended for medium to large flocks of 200 to 1500 birds. The house should have openings on two or more opposing sides or at the very least on one side for ventilation. Optimal ventilation can be achieved if the house is at least 8 m wide and the end walls are closed.

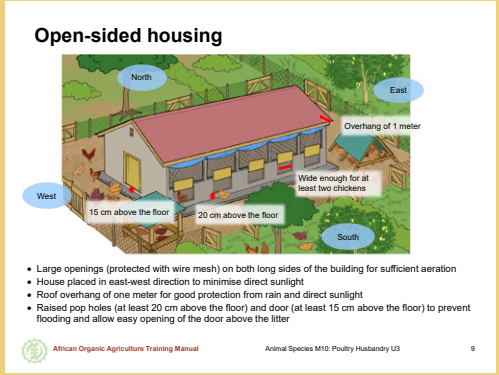
Conversion of an existing building

It may be more practical and cost-effective to convert an existing building or room into a chicken house. However, it must be assured that enough fresh air and light can be provided, that the room is easy to clean, and has an adjacent outdoor area. To ensure adequate ventilation, either a whole side is removed and replaced by wire mesh or large openings are made.

3.4 Construction

The following section provides details for an open-sided deep litter house, but most aspects can also be transferred to other housing systems. It is described as a facility for laying hens, but a house for meat production can look similar, only without the nests.

OPEN-SIDED CHICKEN HOUSE



RECOMMENDATIONS FOR HOUSING (1)

Recommendations for organic poultry housing (1)

	Laying hens	Layer pullets (11 to 18 weeks)	Chicks (until week 10)	Broilers
Stocking rate (animals per m² usable area)	Up to 5	Up to 8	Up to 14	Up to 20 kg per m²
Proportion of littered scratch area (of usable area)	At least 1/3	At least 1/3	At least 1/3	At least 2/3
Outside area (m² per animal)	At least 5	At least 1	At least 0.2	At least 2
Nest area	Max. 5 hens per single nest; at least 120 cm² per hen in group nests	-	-	-
Perches (cm perch per animal)	At least 18	At least 15	At least 8	At least 6 cm per kg live weight
Horizontal distance between between the perches (cm)	30	25	20	20 to 25
Diameter of the perches (cm)	3.5 to 5	Same as adults or smaller	Same as adults or smaller	3.5 to 5

African Organic Agriculture Training Manual Animal Species M10: Poultry Husbandry U3 10

3.4.1 General requirements

The following recommendations are presented as a general example, and do not necessarily correspond to minimum standards from existing regulations, e. g. EU Organic Regulations. Regulations do not necessarily reflect best practice and may not be adapted to the different climatic and local conditions in different African regions. To produce in accordance with organic standards in a country, farmers must consult an organic certification body (see also chapter 8.2 on organic certification).

Recommendations for organic poultry housing				
	Laying Hens	Layer pullets (11 to 18 weeks)	Chicks (until week 10)	Broilers
Stocking rate (animals per m² of ground floor)	Up to 5	Up to 8	Up to 14	Up to 20 kg per m²
Proportion of littered scratch area (of ground floor)	At least 1/3	At least 1/3	At least 1/3	At least 2/3
Outside area (m² per animal)	At least 5	At least 1	At least 0.2	At least 2
Nest area	Maximum 5 hens per single nest; at least 120 cm² per hen in group nests	–	–	–
Perches (cm perch per animal)	At least 18	At least 15	At least 8	At least 6 cm per kg live weight
Horizontal distance between the perches (cm)	30	25	20	20 to 25
Diameter of the perches (cm)	3.5 to 5	Same as adults or smaller	Same as adults or smaller	3.5 to 5
Optimal temperature in °C	18 to 22	From week 8: 18 to 22	Until week 8: 21 to 34 (2 °C decreasing per week)	Start at 32 °C, decrease to 20 °C in small steps in 5 to 7 weeks, depending on weight gain

RECOMMENDATIONS FOR HOUSING (2)

Recommendations for organic poultry housing (2)

	Laying hens	Layer pullets (11 to 18 weeks)	Chicks until week 10)	Broilers
Optimal temperature in °C	18 to 22	From week 8: 18 to 22	Until week 8: 21 to 34 /2 °C decreasing per week of age)	Start at 32 °C, decrease to 20 °C in small steps in 5 to 7 weeks, depend. on weight gain
Required feeding place in cm (hand operated)	At least 16 per animal	At least 10 to 16 per animal	At least 3 per animal	2.5 to 4 per kg live weight
Required feeding place in cm (mecha-nical; chain feeding)	At least 8	At least 6	At least 3	At least 2
Required feeding place in cm (round feeder)	At least 3	At least 3	At least 2	At least 1.5
Required place on round or lengthwise drinker in cm	At least 2.5	At least 2	At least 1	At least 1
Required drinking troughs	At least 1 cup per 20 chickens	At least 1 cup per 25 chickens	At least 1 cup per 25 chickens	At least 1 cup per 25 chickens

African Organic Agriculture Training Manual Animal Species M10: Poultry Husbandry U3 11

	Laying Hens	Layer pullets (11 to 18 weeks)	Chicks (until week 10)	Broilers
Required feeding place in cm (hand operated)	At least 16 per animal	At least 10 to 16 per animal	At least 3 per animal	2.5 to 4 per kg live weight
Required feeding place in cm (mechanical; chain feeding)	At least 8	At least 6	At least 3	At least 2
Required feeding place in cm (round feeder)	At least 3	At least 3	At least 2	At least 1.5
Required place on round or lengthwise drinker in cm	At least 2.5	At least 2	At least 1	At least 1
Required drinking troughs	At least 1 cup per 20 chickens	At least 1 cup per 25 chickens	At least 1 cup per 25 chickens	At least 1 cup per 25 chickens

3.4.2 Stocking and space requirements

Chicken house

As detailed in the chart above, the stocking density in the house should not exceed five laying hens per square meter of the accessible floor. A maximum of 1500 animals are placed per house (if size allows): However, smaller groups of up to 500 chickens are recommended.

Outdoor area

The outdoor area should provide at least five square meters of space per animal. Learn more about recommendations for this area in the section “outdoor run”.

3.4.3 Material

Floor

The floor needs to be dry and flat with a layer of heavy gravel or wire mesh embedded to keep out rats. In organic agriculture, at least one-third of the walkable ground in the house needs to be covered with straw or an equivalent litter material. A deep litter floor system is recommended. In a deep litter system, an ini-

tial layer of litter is spread as scratching material for the animals and to absorb faeces. When the litter is soiled, it is replaced or new layers of litter are added on top. To provide increased ventilation in areas with humidity, the floor can be slatted underneath the perches (maximum 2/3 of the accessible surface).

Smaller buildings for up to 200 chickens can be raised on stilts for protection from flooding and predators. In this case, the same flooring requirements apply (maximum 2/3 can be slatted or made of wire mesh or other materials). The floor should be raised at least one meter to allow for cleaning and good ventilation, and the stilts should be rot-resistant or have stone/ concrete footings.

Litter

Any material like wood shavings, straw, wood chips or hay is suitable. Always keep in mind that litter particles are also eaten by some chickens. Therefore, only material which is not poisonous can be used, and wood shavings from poisonous trees must be avoided. If available, the litter material should come from organic production. The litter must be kept dry by bringing in new material regularly (if necessary daily) and needs to be replaced by new litter if it is getting too dirty or before a new flock of chickens is being brought in. Old litter can be composted for use as fertiliser, as it is nutrient-rich.

Manure management

A large volume of droppings will accumulate under the perches. Therefore, farmers should install either a dung pit or a dropping board under the perches. If the house is built on stilts, the droppings that accumulate under the house should also be collected regularly and can also be composted for use as fertiliser.

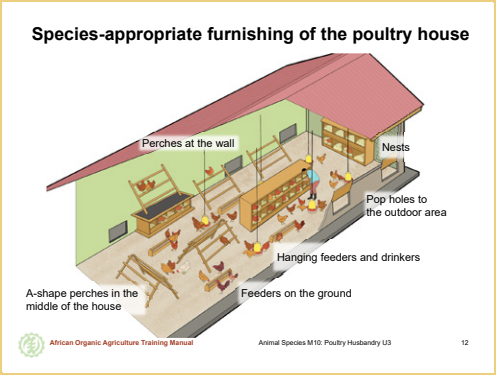
Roof

The roof should be stable and waterproof. It can be made of sheet metal, thatch or tiles. A thatched roof must be replaced approximately every three years or as soon as ticks or mites get into it. The optimal roof overhang of the walls is one meter. This provides the best protection from rain and sun.

Walls

A wall of at least 60 cm should enclose the entire building to prevent flooding and to keep the litter inside. Then, the end walls should be fully enclosed, and the other walls should have windows and wire mesh for ventilation installed. To al-

INTERIOR FURNISHING OF THE CHICKEN HOUSE



low chickens access to the outdoors during the day, small hinged doors (e. g. "pop holes") can be installed in the walls at least 20 cm above the floor. This allows the chickens to easily hop in and out, but also helps prevent flooding and keeps the litter inside. These small doors should be able to be closed firmly during the night for the safety of the birds.

Walls must be rat- and snake-proof and secure against wild predatory animals (e. g. fox, bobcats, weasel). This means that sturdy materials should be used for the walls, and the wire mesh used for the open sides must be fine enough to prevent entry by these predators. Walls should be smooth and easy to clean to prevent an invasion of bugs and mites. Local materials such as wooden slats, mud, bamboo slats, sheet metal, stone walls, concrete or palm fronds can be used for the walls. In colder regions, the walls need to be thicker or insulated.

Windows

The size of the windows depends on the climate but in general, the windows should be as large as possible because good ventilation is critical for chicken health. If possible, the windows should have shutters or curtains that can be closed to protect the animals from wind, rain, dust or sun.

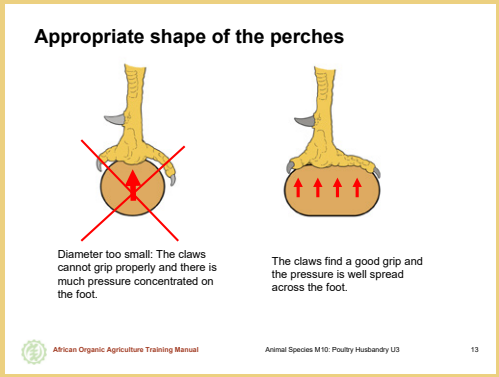
Lighting

The chicken house should be very well lit, as light plays an important role for the growth, sleeping, laying and eating behaviour of chickens. Young chickens will reach sexual maturity more quickly if the length of daylight is slowly increased, as is natural when changing from winter to summer. Laying performance is also positively affected by good lighting, as is eating, as chickens identify food primarily by sight. As a general rule, during the daytime it should be bright enough to read a newspaper anywhere in the house.

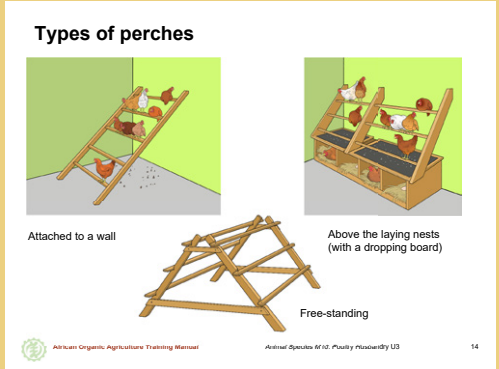
3.4.4 Perches

As previously described, chickens will preferentially choose an elevated roost/perch for safety and comfort while they sleep. Therefore, to support their natural behaviours, it is necessary to provide perching space for each bird in their house. Properly constructed perches also have the advantages of reducing the contact of the animals with their manure, and making the manure easy to remove from the house for use as fertiliser.

SHAPE OF PERCH



TYPES OF PERCHES



Perches can be made in various types. As a general rule, the lowest perch should be at least 50 cm above the floor. The distance between the perches should be 30 to 50 cm, and the distance between the wall and the first perch should be at least 20 cm. The perches should be angled so that the droppings of the chicken above do not fall on a chicken below.

Perches can be made from branches with the bark removed or any other smooth material with a diameter of 3.5 to 5 cm. As shown in the illustration, installing perches with the proper dimensions and shape allows comfortable perching and avoid injuries to the feet of the birds.

Manure management under the perches

Chickens will deposit over half of their manure during the night while they are resting on their perches. Therefore, it is desirable to install a dropping board (first choice) or pit (second choice) below the perches to facilitate cleaning. Dropping boards are preferred because the removal of droppings is easier. Frequent removing of droppings highly increases the air quality in the house. In addition, dung pits may harbour mice and rats and offer hiding places to parasites such as the poultry red mite.

To install a dropping board, a wooden or metal board is placed about 20 cm below the perches that extends from the lowest perch to the wall. This board will catch the majority of the droppings, and make cleaning and removal of the droppings easier. If no dropping board can be installed, the floor under the perches should be slatted with a dropping pit underneath. Dropping boards or pits should be cleaned regularly (boards at minimum every week, pits at minimum every four weeks) to ensure good air quality in the house. The manure can then be dried, stored, and used as fertiliser for plants.

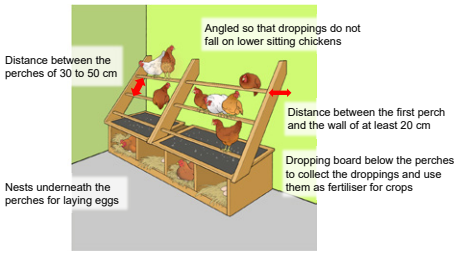
3.4.5 Nests

Various setups and materials can be used for nests. As a general rule, nests should be placed in a shaded place, give easy access for egg collection, and be removable for thorough cleaning of the chicken house. One nest for every five hens should be provided.

The nests can be either individual, or with several nests together on a shelf. One convenient setup is shown below, with the perches and dropping board installed over individual nests. One can also use baskets, cardboard boxes or pots.

INSTALLATION OF PERCHES

Proper installation of perches



CONSTRUCTION OF A DROPPING PIT (1)

How to build a dropping pit (1)

Photo: Christiane Keppler

CONSTRUCTION OF A DROPPING PIT (2)

How to built a dropping pit (2)

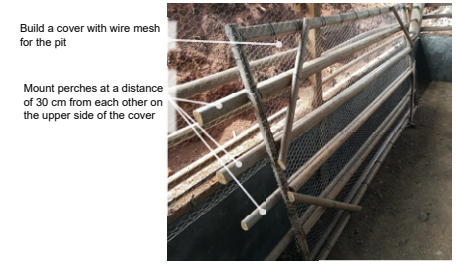


Photo: Christiane Keppler

CONSTRUCTION OF A DROPPING PIT (3)

How to built a dropping pit (3)

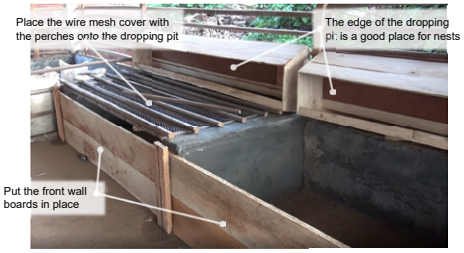


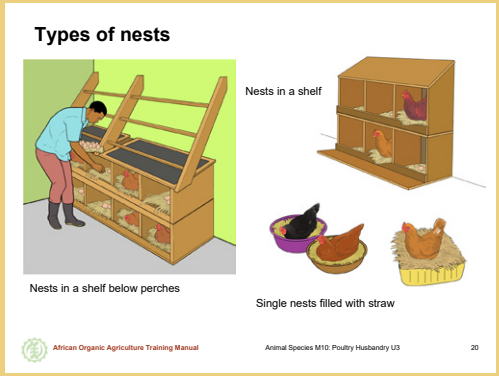
Photo: Christiane Keppler

CONSTRUCTION OF A DROPPING PIT (4)

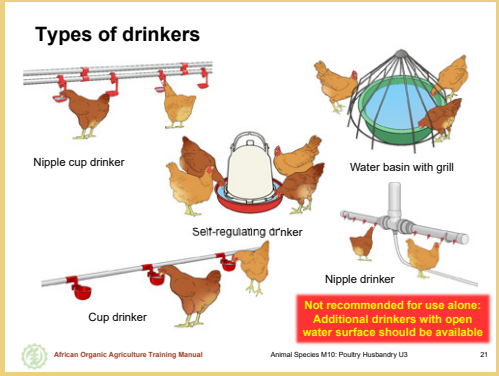
How to built a dropping pit (4)

Photo: Christiane Keppler

NESTS



DRINKERS



To ensure that the hens use the nests, they must be kept clean, and filled with soft, deep, clean litter like husks, straw, hay or shavings. The litter should be softer and deeper than the litter used on the ground to encourage the chickens to lay their eggs in the nests and not on the ground. To make nests more attractive and prevent the chickens from laying on the ground or outside the hen house, it is also advisable to place nests at different levels. Some chickens prefer laying eggs at ground level, and others prefer to lay eggs higher up. If the chickens have support to reach a nest, e. g. a branch in front of the nest that they can fly to before entering the nest, the nests can be at a height of up to 1.5 m.

Ideally, hens should have to cross perches or a short surface of wire mesh or slats to get into the nests. This helps clean the feet of the hen before entering the nest. If one has a henhouse with a dung pit, it is therefore advisable to install the nests above the dung pit, so that the birds cross the wire mesh before entering the nests.

3.4.6 Feeders and drinkers

Sufficient and clean water and feed is essential for the productivity and health of chickens. Therefore, there should be enough feeders that all birds can eat at the same time, and enough drinkers distributed throughout the house to allow easy access to water for all birds.

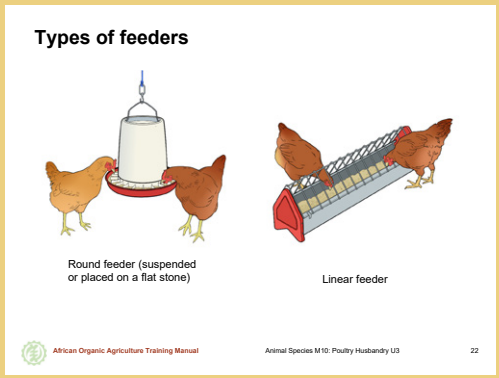
Feeders

Feeders should be kept clean, and should be located in the house rather than in the outdoor area. To avoid wastage, a feed trough should not be filled to more than 1/3 of capacity. Before putting new feed in the feeders, old feed and droppings musts be removed, and spilled feed must be cleaned up regularly as it can lead to moulding or attract unwanted animals.

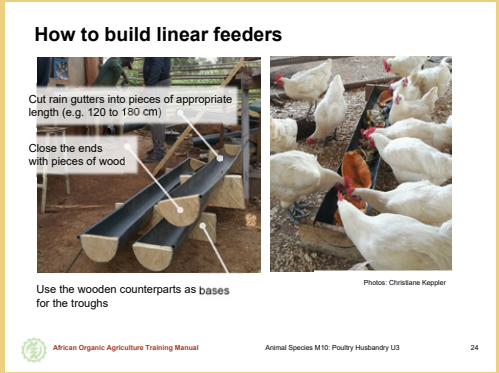
Drinkers

Drinkers should be kept clean, and should be located in the house. They should always be placed in the same location, as the birds get used to their placement. Design drinkers that the birds cannot sit on or in them, and so water does not run back into the tank or water pipe that supplies them. Drinkers supplied with water pipes or tanks will need the piping and tanks cleaned regularly. Additionally, position them high enough that litter is not scratched into them, but low enough that all chickens, even the smallest one, can easily reach the water surface.

FEEDERS



SELF-MADE FEEDERS



Chickens should have the opportunity to drink from an open water surface. This is especially important in warmer regions, as chickens need to drink a lot to prevent heat stress. With only nipple drinkers, chickens have been found to drink less water, which can have negative effects on egg production and behaviour. Therefore, an open water surface should always be provided even when using nipple drinkers. It is worthwile to spend the necessary time to provide the birds with constant, easy access to clean water.

Type of drinker or feeder	Pros and cons
Cup drinker	+ Open water surface + The dirty water does not go back to the tube – Regular cleaning of the cups is necessary
Nipple-cup drinker	+ Less wet litter compared to nipple drinker + The dirty water does not go back to the tube – Regular cleaning necessary – Difficult to clean
Self-regulating drinker	+ Self-regulating (with tank filled by hand or automatically per water pipe) + Open water surface + Can be hung up – Daily cleaning necessary
Water basin with grill	+ Open water surface – The water becomes polluted very quickly and must be cleaned daily
Nipple drinker (not recommended unless paired with another open source of water)	+ Consistent delivery of clean water + No need of cleaning from litter or feed – Requires stretching of the neck – No open water surface
Linear feeder	+ Different sizes available + Stable material + Can be self-made – Daily cleaning and filling

Type of drinker or feeder	Pros and cons
Round feeder	+ Self-regulating (tank or pipe) + Can be hung up or otherwise placed on flat stones to be high enough above the litter
Self-made vertical feeder (not recommended)	+ Cheap + Use of local available material + Customised – Provide too few feeding places

Note: Self-made vertical feeders are often shown on the internet as a cheap and easy way to make homemade feeders. Unfortunately, they do not provide sufficient feed access for all birds, therefore increasing the risk of pecking, stress, and weight loss if one has more than a few chickens.

3.4.7 Cleaning and disinfection

Once the chicken house is properly constructed, care must be taken to keep it clean to protect both the birds and the investment made in the structure. Simple cleaning steps help prevent diseases and extend the life of the chicken house:

Example of a cleaning schedule	
Frequency	**Measure**
Daily	› Empty and clean feeding and watering troughs. › Remove wet and dirty bedding. › Add dry bedding as necessary.
Weekly	› Thoroughly clean and dry feeding and watering troughs (more frequently for chicks).
Monthly	› Dust cracks and crevices with diatomaceous earth powder (as described below).
At the end of an “all-in/all-out” cycle, after a disease outbreak, or at least twice yearly	› Clean and disinfect the entire chicken house (as described below).

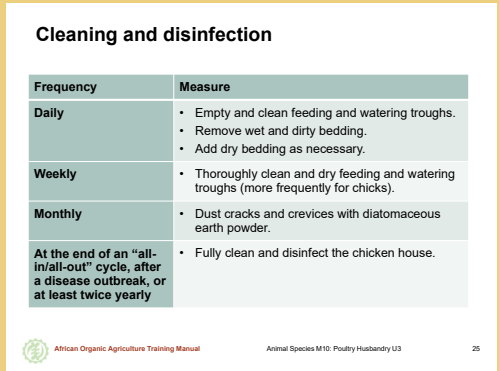
Exercise: Building a poultry house

Ask the participants to draw a plan for a poultry house which would fit into his/her farm. Ask them to add to the plan:

› Specific material used and expected dimensions
› A list with feeders, drinkers, nests and perches (types and numbers)
› Types and numbers of birds (breed, gender, age)
› Design of the outdoor area (plants, dimensions, elements, other animals)

Ask the all participants to present their plans, ideas and thoughts to the group or to small groups of 4 participants. At the end all report back to the group for a larger discussion.

CLEANING AND DISINFECTION


Cleaning and disinfection

Frequency	Measure
Daily	• Empty and clean feeding and watering troughs. • Remove wet and dirty bedding. • Add dry bedding as necessary.
Weekly	• Thoroughly clean and dry feeding and watering troughs (more frequently for chicks).
Monthly	• Dust cracks and crevices with diatomaceous earth powder.
At the end of an “all-in/all-out” cycle, after a disease outbreak, or at least twice yearly	• Fully clean and disinfect the chicken house.

African Organic Agriculture Training Manual Animal Species M10: Poultry Husbandry U3 25

Whether practicing all-in/all-out (all-in/all-out management is explained in the chapter “Health and diseases”) or simply preparing a space for new birds, the steps listed in the table below should be followed. Cleaning should begin several days before the new birds are scheduled to move in. To facilitate cleaning and drying, a dry and sunny day should be chosen. Cleaning and disinfection take time and require the completion before each of the following steps. Skipping or not completing a step can lead to failure, and the survival of harmful viruses, bacteria, fungi, and parasites that can harm the next flock.

However, not all farms require the full procedure, as this very much depends on the number of birds as well as on the intensity of management. Not all farms will have the resources to complete all the steps, so the best course of action is to do as much as possible. Steps 1 to 5 and 7 should always be carried out, step 6 (disinfection) is recommended in case of health problems in the previous flock. Disinfection without previous cleaning and drying is useless!

The steps to cleaning and disinfecting chicken houses and equipment

Step	Details	Equipment
1. Removal of birds and equipment	› Take out the removable feeders, waterers and perches to clean them separately (steps 2 to 6).	› None
2. Dry cleaning	› Remove all feed, dirt, dust and litter from the house.	› A scraper to remove caked-on manure › Dustpan and broom
3. Wet cleaning	› Remember to turn off power (electricity) to the building before starting!	
3.1. Soaking	› Soak the most heavily soiled areas like perches and roosts in order to soften any remaining manure.	› Hose or bucket
3.2. Washing	› Thoroughly wash ALL surfaces including window sills, ceiling, walls, etc.	› Hot water (ideally at least 70 °C/ 160 °F; works better than cold water) › Mild soap › A stiff brush

3.3. Rinsing	› Rinse all surfaces to remove any remaining detergent.	› Hose or bucket
4. Drying	› Mop up any remaining puddles of water, then air dry the building for 12 to 48 hours (depending on the weather). › Use a fan to speed the process if available.	› Mop or rags › A fan (if available)
5. Repairs	› Make necessary repairs (i.e. cracks in roof, walls, floor to prevent rain, wild birds and rodents to enter the building). Holes in the roof and rodent entry holes always need to be closed immediately if they occur.	› Construction materials
6. Disinfection with chemicals (best option in case of health problems in the previous flock)	› Take proper safety measures. › Identify a disinfectant and spray all inside surfaces. A rule of thumb is to apply one gallon of correctly diluted disinfectant per 150 to 200 square feet of surface area (= 2 to 2.7 liters per 10 square meters).	› Garden sprayer (or larger for larger buildings)
7. Disinfection of movable materials (if chemicals are not available)	› If no disinfectants are available, finish step 3 of cleaning, then place all movable materials (feeders, waterers, perches, nest boxes) in the direct sunlight for one day to dry. › Then, if black plastic bags are available, place the dry items in the bags, close, and leave them in the direct sunlight for one additional day.	› No equipment needed. UV-light from the sun has some disinfecting power. › In the sun, high temperatures develop inside the bags and can help to disinfect the items and kill mites.
8. Control of external parasites like fleas, ticks, mites and lice	› When the structure is completely dry again, dust cracks and crevices with diatomaceous earth to kill any fleas, ticks, mites or lice that remain after cleaning.	› Diatomaceous earth powder (a substance that harms the exoskeletons of parasites like ticks and lice, causing them to die) http://npic.orst.edu/factsheets/degen.html

Safety measures for contact with chemicals:

- Wear proper protective clothing (i. e. mask and goggles for spraying and dusting, gloves for handling items in a bleach solution).
- Never mix disinfecting agents, as they may produce fatal chemicals.
- Some of the chemicals can be caustic to skin, eyes, and fatal if ingested. Use and store them carefully.
- Follow the directions carefully – if in doubt, ask a veterinarian or local animal health worker.
- Some of the chemicals should not be used on unfinished wood that will come into close contact with animals. Use caution in selecting the disinfectants if the nest boxes or perches are wooden, as the chemicals can be absorbed and harm the animals.

Lists of cleaning substances: The following lists are a general example of organic-approved substances. Other organic-approved and locally available substances may be used in collaboration with a veterinarian.

Surface disinfection

Surfaces should be sprayed with an organic-approved disinfectant using the dilution according to the directions. In case of doubt, the local organic certification body should be contacted before usage.

Examples of organic-approved disinfectants:

- Sodium hydroxide, calcium hydroxide
- Sodium carbonate
- Organic acids (formic acid, lactic acid)

For disinfection of feeders and waterers, they are soaked in a solution of an organic-approved disinfectant.

3.5 Outdoor run

The outdoor run that the chickens use during the day should be properly accessible, bedded, fenced, fitted with objects providing shade and sand baths, and well-maintained.

Discussion on cleaning and disinfection

Invite the participants to discuss in small groups the following questions:

- What is your current cleaning and disinfection routine?
- What substances/ chemicals do you use?
- What are you NOT doing that was presented and why?
- Do you consider adapting you current routine? Why or why not?

POP HOLES

Access to the run

One option to give chickens access to the outdoor run during the day are small doors or "pop holes" in the walls of the house. These openings should be at least as wide as two hens sitting side-by-side to allow easy circulation of the hens. At night, the openings should be tightly closed to protect the chickens from predators.

Bedding

Ideally, the ground in the run is covered with compostable material like wood chips or other dry plant material. This material should be replaced and composted regularly as it accumulates nutrients from the faeces and worm eggs (parasites).

Fencing

General recommendations:

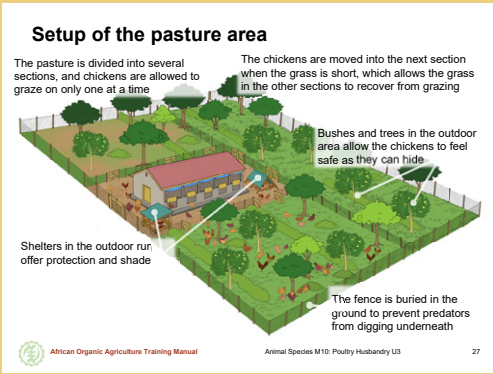
- The fence should have a height of 1.2 to 2.0 m (depending on the breed) to ensure that the chickens do not leave the outdoor run.
- The bottom of the fence is best buried at least 20 cm deep (ideally 60 to 80 cm deep) into the ground. Or, second best, the bottom of the fence is folded out at least 40 cm wide on the ground and weighted down with dirt or rocks. The predators that will try to dig directly at the fence will not be able to get through the folded-out fence material.

The fence should be checked regularly in order to detect and fix holes in a timely fashion.

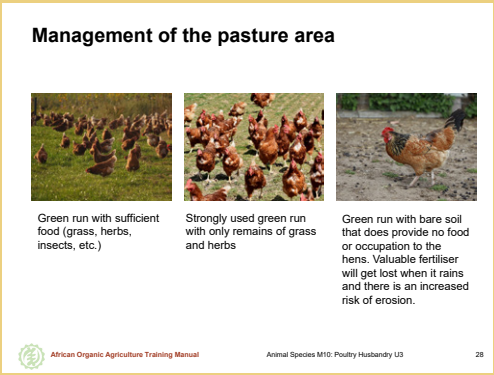
Shading elements, sand baths and gravel

The outdoor run should have elements to provide shade and protection from predators, and offer access to a dust bath. The elements can be small bushes and trees or mobile elements like roof-covered sand baths. Roof-covered sand baths are especially suitable as the they provide shade, shelter and dry sand. Ideally, the different shading elements are situated not more than 20 meters apart from each other and equally distributed, even in the distant part of the run from the chicken house. This will encourage the hens to get out of the house and to spread evenly in the entire pasture.

PASTURE AREA



GRASS COVER MANAGEMENT IN THE PASTURE



In the outdoor run, chickens must also be able to find small gravel which they swallow to help crush the feed in their stomachs.

High grass in and around the run should be cut regularly, if not kept short by the chickens, to decrease survival of the eggs and larvae of poultry parasites.

3.6 Pasture system

A well-designed pasture system outside the chicken run can provide benefits to the chickens and to the land. Chickens can engage in their natural behaviours, and receive nutritional benefits from feeding on insects and plants of their choice. Parasite pressure is reduced as birds are moved from one pasture to another. Chickens eat ticks and other harmful insects, and leave valuable, nitrogen-rich fertiliser behind in the form of droppings. Ideally, the pasture areas are fenced.

The available area should be split into several separate pastures. This allows for rotation of the flock to ensure recovery of the pasture. It prevents overgrazing and destruction of the vegetation. Furthermore, proper rotation improves the availability of feed and reduces parasite pressure.

Pasture selection and maintenance

As with other livestock species, selection and maintenance of the pasture areas are important. When selecting potential pasture areas, wet and humid areas should be avoided as they bear a greater risk of parasitic infection.

Pasture maintenance requires planning and resources. For example, cutting of grass and sowing new grass may be necessary.

Encouraging the birds to use the pasture

In the beginning, some movable elements may need to be placed close to the chicken house to encourage the birds to explore the new pasture. If the birds do not feel safe, they will stay near the entrances, both increasing parasite pressure and destroying the pasture in that area.

Scattering grains in the run can also be helpful to encourage the chickens to use the entire pasture. However, this can attract wild birds or other animals which can spread diseases. Therefore, only the amount of grains should be scattered which is immediately eaten by the chickens while under supervision.

OUTDOOR RUN

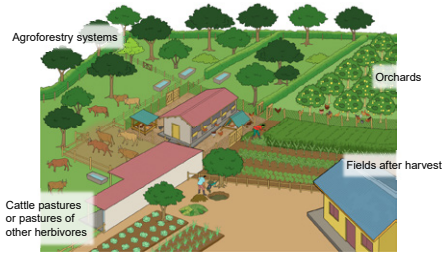
Chicken run

Photo: Thomas Alföldi (FiBL)

ALTERNATIVE PASTURES

Alternatives to an exclusive chicken pasture

Instead of running in an exclusive chicken pasture, chickens can forage in...



FORAGING WITH CATTLE

Hens foraging in cattle paddock

Hens feel protected from predators when close to herbivores

Photos: Christiane Keppler

Chickens feed on insects and mites attracted by herbivores

Additional safety recommendation:

Adding some black chickens in the flock deters predatory birds, as the black chickens look like crows.

Co-grazing the flock with other livestock on the farm

Grazing the poultry flock in the same pasture with other livestock (e.g. cattle, goats, sheep, horses) offers multiple benefits. The dung of the livestock attracts insects, which provide valuable protein-rich nutrition to the chickens. Predators are deterred by the presence of the other animals. The other livestock benefit from fewer flies and ticks in the pasture, as these are eaten by the chickens.

Grazing the flock as part of an agroforestry system

Planned grazing of the poultry in an orchard or in an agroforestry system can offer benefits, too. Chickens can benefit from fallen fruits, whereas the trees benefit from the chickens eating harmful insects, and from the nutrients released from chicken droppings.

Exercise: building an outdoor run and pasture system

Invite the participants to draw a plan for an outdoor run and pasture system which would fit into his/her farm. The outdoor run can also be integrated in an agroforestry system or implemented as after-harvest grazing.
The plan should contain the following elements:

- Dimensions
- Indications on the material used for fencing
- Trees, bushes, sand baths, and other elements for protection and occupation

Ask then the participants to share their plans in small groups and to suggest improvements to each other.
At the end, all participants should report back to the entire group for a larger discussion on the benefits and the costs of the found solutions.

If there are no fenced-in pastures, the chickens can be released into areas with adequate shade and shelter. However, they need to be supervised as they graze. In the evening, they must be herded back into their run or chicken house. When the grass is becoming too short, the chickens should be assigned a new area.

Grazing the flock after a grain harvest
Chickens can also be grazed in grain fields after harvest. Residues from harvest can be a highly valuable feed for the chickens. The same rules apply as for other methods of unfenced grazing.

4. Feeding and drinking

4.1 Introduction

Feeding plays a key role for chicken health and performance. With inappropriate nutrition, layers or broilers will not be able to perform to their potential. Also, their immune system is weakened, making them more prone to illness and diseases. Ensuring an appropriate diet that meets the nutritional needs of the animals will pay off with good health and performance of the birds.

Concerning the sources of feed: Certified organic producers must use organically produced feed from the own farm or from proven biological sources to the best of their ability.

Which feed is suitable?
Different chickens have different nutritional needs. Needs depend e. g. on age, purpose and breed (layers, dual purpose breeds or broilers). Therefore, the perfect chicken feed for all situations doesn't exist. However, some farmers may be able to purchase a commercially produced "complete feed" that has been specially formulated to take into account the type and life stage of the birds. Such feeds are formulated to satisfy all of the nutritional needs of the birds without requiring any other feed or supplements. Therefore, they are a safe and easy solution. The same applies for organic complete feed in the case of certified organic production.

However, many farmers do not have access to, or cannot afford commercial organic complete feed, or wish to mix their own feed using components found

PLANT-BASED FEED RICH IN ENERGY

Plant-based feed components rich in energy

African Organic Agriculture Training Manual Animal Species M10: Poultry Husbandry U3 32

FEED SOURCES RICH IN CARBOHYDRATES

Common feed high in carbohydrates

Feed	Carbohydrates	Proteins	Fats	Minerals	Vitamins
Barley	+++	+	+	+	+
Beans	+++	+++	+	+	++
Maize	+++	+	+	+	+
Millet	+++	+	+	+	+
Oats	+++	+	+	+	+
Peas	+++	+++	+	+	++
Potatoes	+++	+	–	+	+
Rice	+++	+	+	+	+
Rye	+++	+	–	+	+
Sorghum grain	+++	+	+	+	+
Wheat	+++	++	+	++	+

+++ high content, ++ medium content, + low content, - none

Source: Ahlers C. et al., 2009, Improving village chicken production, p. 55, modified by FiBL

African Organic Agriculture Training Manual Animal Species M10: Poultry Husbandry U3 33

or grown on the farm. In this case, it is important to understand the basics of chicken nutrition, as explained in the following sections. Additionally, someone experienced should be consulted to critically check whether the planned feed rations are sufficient for the respective chickens.

4.2 Basics of nutrition

4.2.1 Energy

Animals, as humans, need enough energy in the form of calories to survive and thrive. Calories can originate from carbohydrates, fats or proteins. In addition to energy, all animals also require vitamins and minerals. All feed sources contain a mixture of some or all of these components. However, too much or too little of some components can lead to health and productivity issues for the birds.

4.2.2 Carbohydrates

Carbohydrates are a quick source of energy. They should make up the largest part of a bird's diet, more precisely 68 to 74 % of the diet. 2 to 8 % of the carbohydrates, depending on the age and type of the birds, should be fiber.

The main common sources of carbohydrates are cereal grains and the stalky parts of plants for fiber. A good mixture of grains and access to pasture will provide an excellent feed base for chickens.

When mixed into a feed ration, grains should be coarsely ground, with the grain components still visible (not finely ground as flour).

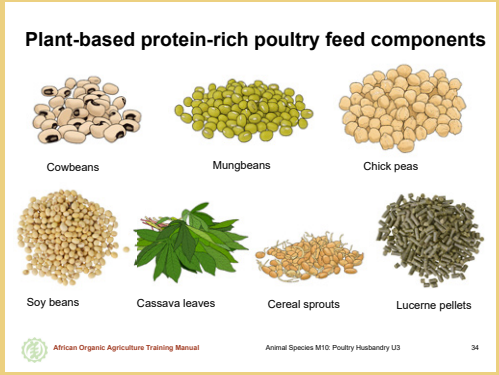
Grains can also be soaked in water for a few hours before feeding them to the chickens. Smaller portions of wheat grains can be scattered in the littered area to increase scratching activity.

4.2.3 Proteins

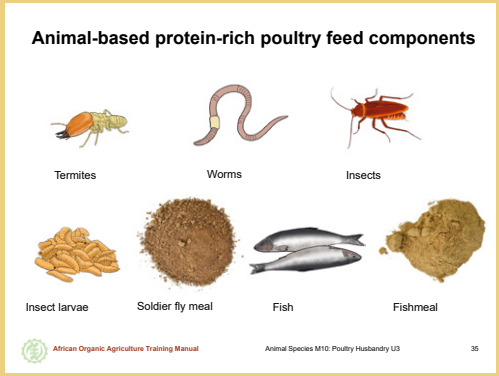
Proteins make up the next largest part of a bird's diet . Depending on the age and type of bird, they should make up 16 to 22 % of the diet.

In their bodies, the birds break down the proteins into their components, called amino acids. Birds need 20 different amino acids to live and grow. A bird's body can produce ten of these amino acids itself, essentially from other amino acids. However, the other ten amino acids need to be provided from good quality protein sources in the diet. Unfortunately, there is no protein source that contains all of the essential amino acids that birds cannot produce themselves.

PLANT-BASED PROTEIN-RICH FEED SOURCES



ANIMAL-BASED PROTEIN-RICH FEED SOURCES



Therefore, different protein sources need to be mixed in order to get a suitable ratio of all essential amino acids.

The amount of protein in the diet should be estimated carefully, as too much protein in the diet can be harmful to the birds, negatively affect the environment (with excess excretion of nitrogen), and is expensive.

Common sources of protein are legumes (beans, peas, groundnuts, etc.), insects and fish by-products (e. g. fish meal). In cereal grains, the protein content is quite low, but can be increased by the sprouting of the grains.

Lysine and methionine are two amino acids that are very important in poultry diets. Deficiencies of lysine and methionine can cause reductions in production and overall health. Therefore, they should be given special attention when choosing protein-rich feeds.

Important sources of lysine are animal proteins from e.g. fishmeal and other fish products, and dairy products; and plant-based proteins from dried yeast, meal/cake from oil plants, lucerne meal, maize gluten, potato protein, and grain legumes.

Important methionine sources include animal sources like fish meal and fish products, milk powder, and plant feed sources like brewer's yeast, soybean cake, rapeseed cake, potato protein, sunflower seed cake, and millet.

4.2.4 Fats

Fats should make up a small part of a bird's diet. Depending on the age and the type of the bird, fat should make up 4 to 6 %. Fats are rich in calories and help ensure that the birds get enough energy from the diet. They also help the birds to digest certain vitamins, and give the feed a good taste.

Fats are important in hot climates, as the energy from fat is easily absorbed. Therefore, under very hot conditions, carbohydrates should be partly replaced by fats in the diet to prevent birds from overheating.

Absorbed fats are also transferred to the eggs. Providing the correct amount and type of fats contributes to a balanced mixture of "good fats" (omega-3) and "bad fats" (omega-6) in the eggs, and thus to healthier eggs for consumers.

Common sources of fats are animal and vegetable oils (and their by-products e. g. sunflower seed oilcake). Fat sources like flaxseed, camelina and fish meal have high levels of "good fats" (omega-3) that are important for human health.

PROTEIN-RICH FEED SOURCES

Common protein-rich feed sources

Feed	Carbo-hydrates	Proteins	Fats	Minerals	Vitamins
Beans	+++	+++	+	+	++
Cereal grains (sprouted)	+++	++	+	+	+
Fish	+	+++	++	+++	+++
Groundnuts	++	+++	+++	+	+
Insects	++	+++	++	+++	+++
Insect larvae	++	+++	++	+++	++
Leaves (various)	+	++	–	+++	+++
Lupins	+	+++	+	+	++
Oilseed cakes	++	+++	++	++	++
Peas	+++	+++	+	+	++
Rapeseed	++	+++	+++	++	++
Soybeans	++	+++	+++	+	++
Sunflower seed	+	+++	+++	++	+
Termites	++	+++	++	+++	+++
Worms	++	+++	++	+++	+++

+++ high content, ++ medium content, + low content, – none

Source: Ahlers C. et al., 2009, Improving village chicken production, p. 55, , modified by FiBL

4.2.5 Minerals

Minerals make up a small, but vital part of a bird's diet. Minerals enable critical reactions in the body. Calcium and phosphorous are essential for the formation of strong bones and a hard egg-shell. The key minerals calcium, phosphorous and sodium should make 1 to 5 % of the feed ratio, depending on the age and type of bird. The necessary calcium : phosphorus ratio varies depending on the stage and type of bird. While growing birds need a ratio of 1 to 2 parts of calcium to 1 part of phosphorous, laying hens need more calcium (3 to 6 parts of calcium to 1 part of phosphorous).

Sodium (salt) is usually found in sufficient amounts in a normal diet. Attention must be paid to not overfeed the birds with food left-overs that have been seasoned with salt. Cooked food left-overs should be rinsed or soaked and strained before feeding them to chicken.

Common sources of minerals (especially of calcium) include limestone, oyster shells, snail shells or egg shells. If none of these sources are available, a commercial organic premix (e. g. a purchased mix like shell grit) should be used.

NOTES ON FEEDS

Notes on specific feed sources

Feed	Notes
Beans (e.g. soybeans, cowbeans, mungbeans)	• Should be broken into pieces small enough to be swallowed easily by the chickens (but not ground to powder). • Can be fed as sprouts (after sprouting under moist conditions for a few days; attention: avoid moulding, as mould is a health risk and can be poisonous). • Soybeans must be heat treated before feeding, as untreated beans can be poisonous to chickens.
Cereal grains (sprouted)	• Higher protein content and more vitamins after sprouting • Avoid moulding during sprouting!
Leaves	• Cassava and bean leaves have particularly high protein contents.
Insects (e.g. termites, ants, worms)	• More insects if co-grazed with ruminants or if cow dung is dispersed in the poultry pasture • Creating natural insect habitats like brush piles to the poultry pasture area can attract insects. Dispersal of the brush piles eases the access to the insects.
Oilseed cakes (e.g. cotton, sunflower, copra, sesame, palm kernel cakes)	• Can be bought in case of a lack of other protein sources.

FEED HIGH IN FATS

Common feed high in fats

Feed	Carbo-hydrates	Proteins	Fats	Minerals	Vitamins
Animal fats	–	–	+++	–	–
Groundnuts	++	+++	+++	+	+
Plant oil	–	–	+++	–	–
Soybeans	++	+++	+++	+	++
Rapeseeds	++	+++	+++	++	++
Sunflower seeds	+	+++	+++	++	+

+++ high content, ++ medium content, + low content, - none

Source: Ahlers C. et al., 2009, Improving village chicken production, p. 55, modified by FiBL

FEED HIGH IN MINERALS

Common feed high in minerals

Feed	Carbo-hydrates	Proteins	Fats	Minerals	Vitamins
Bones	–	–	–	+++	–
Eggshells	–	–	–	+++	–
Fish	+	+++	++	+++	+++
Fruit	+	+	+	+++	+++
Insects	++	+++	++	+++	+++
Insect larvae	++	+++	++	+++	++
Snail shells	–	–	–	+++	–
Termites	++	+++	++	+++	+++
Tree and plant leaves	+	+	–	+++	+++
Worms	++	+++	++	+++	+++

+++ high content, ++ medium content, + low content, - none

Source: Ahlers C. et al., 2009, Improving village chicken production, p. 55, modified by FiBL

VITAMINS

Common feed high in vitamins

Feed	Carbohydrates	Proteins	Fats	Minerals	Vitamins
Fish	+	+++	++	+++	+++
Fruit	+	+	+	+++	+++
Insects	++	+++	++	+++	+++
Termites	++	+++	++	+++	+++
Tree and plant leaves	+	+	–	+++	+++
Worms	++	+++	++	+++	+++

+++ high content, ++ medium content, + low content, - none

Source: Ahlers C. et al., 2009, Improving village chicken production, p. 55, modified by FiBL

GENERAL NUTRITION GUIDELINES

General nutrition guidelines for poultry

	Carbohydrates (%)		Protein (%)	Fat (%)	Minerals (%)	Vitamins (%)
	Quick energy	Fiber			Ca : P	
Broiler (meat production)						
Starter (1–3 weeks)	68 - 69	2 - 3	22	5	1 : 1	<1
Grower (4–6 weeks)	68 - 69	3	20	6	1 - 2 : 1	<1
Finisher (7+ weeks)	70 - 71	3	18	6	1 - 2 : 1	<1
Pullet (young hen)						
Starter (1–6 weeks)	70 - 71	3 - 4	20	4	1 : 1	<1
Grower (7–18 weeks)	69 - 74	3 - 7	17	4	1 - 2 : 1	<1
Egg laying hen						
Egg laying hen (19+ weeks)	63 - 73	3 - 8	16 - 18	4	3 - 6 : 1	<1

Source: Nutrition for the backyard flock, Larry Vest and Nick Dale, UGA Department of Poultry Science, Leaflet 396. https://extension.uga.edu/publications/detail.html?number=C954&title=Nutrition%20for%20the%20Backyard%20Flock

Birds should always have access to free choice minerals, starting from a young age (e. g. a separate shallow dish or dishes containing minerals should be available to all birds). Whatever type is chosen, it should be ground to a small size. If using egg shells, they should be roasted and crushed before feeding to avoid getting the birds into the habit of eating eggs.

4.2.6 Vitamins

Vitamins make a quantitatively small share of only about 1 % in poultry diets, but are vital substances. Vitamins are essential for critical chemical reactions in the body metabolism, and contribute to general health with strong bones and high-quality eggs. While Vitamin A is crucial for vision, Vitamin D is involved in bone formation and egg production.

As for proteins, no single source contains all vitamins in the required ideal composition for poultry. However, chickens who have regular access to good pasture, or who are fed high quality vegetable and fruit scraps should not need additional feeding of vitamins. If the animals cannot regularly access good pasture and are not fed vitamin-rich scraps, it may be necessary to add a commercial vitamin mix to the feed. In case of vitamin uptake with natural feed, excessive vitamin intake should not become a problem. However, vitamin supplements have to be applied according to the directions to avoid unhealthy oversupply.

4.3 Other essential feed components

4.3.1 Stomach gravel

Chickens don't have teeth, so they swallow their food whole. The feed is then soaked in the crop and ground in the stomach. To allow grinding in the stomach, chickens swallow small stones. Over time, these stones are ground down, and chickens must swallow new ones. Therefore, chickens need to have access to appropriate stones regularly and from the first week of life. Stones of e. g. quartz, granite or basalt, which are resistant to the acidic surroundings in the stomach, last the longest and are therefore most suitable.

Chickens in traditional free-range systems usually find appropriate stones themselves, as they roam around freely and are usually guided by their mother hen. In a semi-intensive system, it is important to offer stomach stones to the chickens, e. g. presented in a shallow dish in the chicken house. This dish can be placed next to the dish containing the minerals.

STOMACH GRAVEL SIZES

Appropriate stomach gravel sizes for poultry

Stomach gravel

Appropriate stone size by age of bird:

1st to 2nd week:
1 g per animal (diameter 1 - 2 mm)

3rd to 8th week:
2 g per animal (diameter 2 - 4 mm)

From 9th week:
3 g per animal per month (2 - 5 mm)

African Organic Agriculture Training Manual Animal Species M10: Poultry Husbandry U3 42

BENEFITS OF ROUGHAGES

Advantages of roughages in poultry feeding

Roughage

Benefits of offering cut plant material:

- Satisfies the chickens' instinctive need to eat structured feed and prevents boredom (and thus feather pecking and cannibalism).
- Has a positive effect on the development and health of the gizzard and intestine (from the fibre).
- Increases the utilisation of amino acids in the feed, reducing the nitrogen content in the urine and manure.
- Keeps manure more firm, which keeps the litter dry and reduces infection pressure.

African Organic Agriculture Training Manual Animal Species M10: Poultry Husbandry U3 43

4.3.2 Roughage

Poultry should have access to roughage, too. Hens with access to a green pasture will naturally eat the amount of roughage they need. But it is always advisable to additionally offer fresh or dried plant material (e.g. hay) in the hen house. This is especially important if the plant cover in the pasture is scarce or pasture access is limited.

Roughages provide important carbohydrates in the form of fiber, proteins, fats and vitamins. Eating feathers is a serious sign of a lack of roughage and often leads to feather pecking. If feather eating is observed in a flock, additional roughage must be supplied immediately.

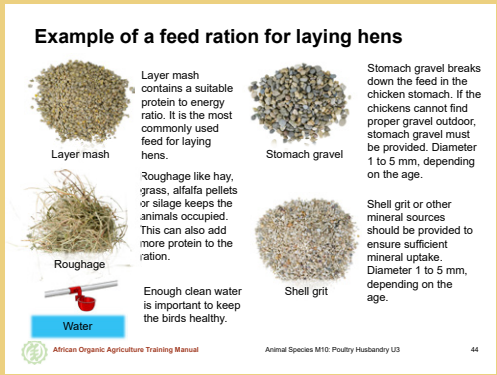
Benefits of roughage intake:

- Fulfils the chickens' instinctive need to eat structured feed and prevents boredom (and thus feather pecking and cannibalism).
- Has a positive effect on the development and health of the gizzard and intestine due to the fiber.
- Increases the uptake of amino acids from the feed reducing the nitrogen content in the urine and the manure.
- Results in firmer manure which keeps the litter dry and reduces infection pressure.

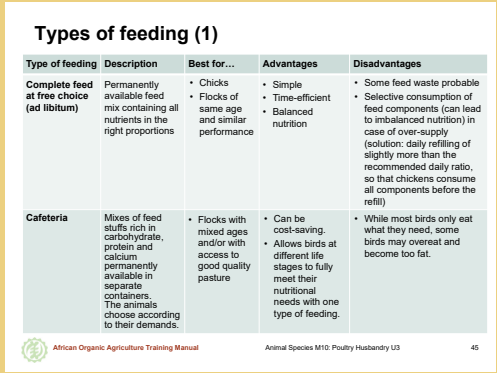
4.3.3 Water

The bodies of chickens consist of 60 % water, and the inside of the eggs are 70 % water. Continuous access to clean water is critical for the health and productivity of chickens. In hot climates, water is even more important, as it helps the birds to maintain their body temperature and avoid overheating. Chickens require significantly more water in hot temperatures. While a laying hen's water requirement is 200 ml at 0 °C per day, it is three times as high (600 ml) at 38 °C. Therefore, it is essential that the animals always have enough fresh water, and that a regular schedule for cleaning the drinkers and connecting hoses and pipes is maintained.

EXAMPLE OF A FEED RATION FOR LAYING HENS



TYPES OF FEEDING (1)



Types of feeding (1)

Type of feeding	Description	Best for…	Advantages	Disadvantages
Complete feed at free choice (ad libitum)	Permanently available feed mix containing all nutrients in the right proportions	• Chicks • Flocks of same age and similar performance	• Simple • Time-efficient • Balanced nutrition	• Some feed waste probable • Selective consumption of feed components (can lead to imbalanced nutrition) in case of over-supply (solution: daily refilling of slightly more than the recommended daily ratio, so that chickens consume all components before the refill)
Cafeteria	Mixes of feed stuffs rich in carbohydrate, protein and calcium permanently available in separate containers. The animals choose according to their demands.	• Flocks with mixed ages and/or with access to good quality pasture	• Can be cost-saving. • Allows birds at different life stages to fully meet their nutritional needs with one type of feeding.	• While most birds only eat what they need, some birds may overeat and become too fat.

4.4 Organic approach in poultry nutrition

4.4.1 Organic feed components and feed mixing

For certified organic poultry production, in principle all feed components must originate from organic production. This applies for complete feeds as well as for feed components that are produced and mixed on the farm. However, sourcing organic feed components is not always possible. In this case, the options should be discussed with a feeding expert and the certification body.

Mixing feed is a complex task, as the feed must be appropriate for the age and type of bird (broiler, layer or dual purpose), and involves many factors like the local climate, the season, access to quality pasture, and the availability of local feed components.

Examples of feed rations are available at infonet-biovision.org › Animal health › Chicken). Feeding programs are best designed with the help of experienced extension agents and in coordination with the local organic certification body.

4.4.2 Feed storage

Feed must be properly stored to prevent contamination (e.g. mould) that can lead to disease, losses due to storage pests, and to preserve the nutrients in the feed.

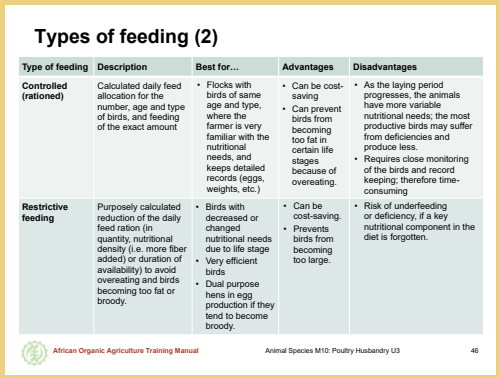
The feed should be stored in a cool and dry place to maximise storage time and quality. Plastic bins with lockable tops, or tightly-constructed wooden bins with tightly closing tops are suitable.

4.5 Feeding management

4.5.1 Types of feeding

Different management systems, types of birds, and availability of feed components and pasture require different types of feeding. On the slides, it is explained, when the different types might be used, as well as their advantages and disadvantages. In each system, it is essential to watch the birds daily to monitor weight gain or loss, and adjust the feeding accordingly, as birds that are too thin or too fat will have decreased health and performance.

TYPES OF FEEDING (2)



Types of feeding (2)

Type of feeding	Description	Best for…	Advantages	Disadvantages
Controlled (rationed)	Calculated daily feed allocation for the number, age and type of birds, and feeding of the exact amount	• Flocks with birds of same age and type, where the farmer is very familiar with the nutritional needs, and keeps detailed records (eggs, weights, etc.)	• Can be cost-saving • Can prevent birds from becoming too fat in certain life stages because of overeating.	• As the laying period progresses, the animals have more variable nutritional needs; the most productive birds may suffer from deficiencies and produce less. • Requires close monitoring of the birds and record keeping; therefore time-consuming
Restrictive feeding	Purposely calculated reduction of the daily feed ration (in quantity, nutritional density (i.e. more fiber added) or duration of availability) to avoid overeating and birds becoming too fat or broody.	• Birds with decreased or changed nutritional needs due to life stage • Very efficient birds • Dual purpose hens in egg production if they tend to become broody.	• Can be cost-saving. • Prevents birds from becoming too large.	• Risk of underfeeding or deficiency, if a key nutritional component in the diet is forgotten.

African Organic Agriculture Training Manual Animal Species M10: Poultry Husbandry U3 46

4.5.2 Timing of feeding

Based on the daily rhythm of the birds, it is advisable to feed them in the morning and in the late afternoon or evening (e. g. at 8 a.m. and 6 p.m). The last feeding of the day also helps to attract the chickens into the hen house in the evening.

Access to the pasture is best allowed early in the morning and in the late afternoon, as there are more insects and less heat. This is also the time when chickens search for food under natural conditions. When the chickens have free access to their hen house, access to the outdoors can be granted during the entire day.

For laying hens, the pop holes are best opened later in the morning, after most eggs are laid, to prevent laying activity outdoors. Usually, the pop holes are then left open during the entire day. If chickens don't have access to the hen house during the day, water must be provided outside in shady places.

4.5.3 Feed preparation

Proper preparation of the feed is as important as the composition. If the food is not appealing or has lost nutritional value because of its preparation, time and money are wasted, and the health and performance of the birds can suffer. When preparing poultry feed, two main recommendations should be followed:

- **Correct consistency:** The components should only be ground coarsely to approximately 1 to 2.5 mm large particles. They shouldn't be ground finely like flour.
- **Soaking:** Some rations may be more palatable when soaked prior to feeding. Additionally, soaked feed supply additional water in very hot weather. The feed should be soaked just before feeding. And before each feeding the feed troughs should be cleaned to avoid spoilage.

4.5.4 Seasonal considerations

When designing a feeding plan, producers must not only consider the nutritional needs of the animals, but also the change of seasons, and how that might affect the availability of feed components. For example, the nutrient availability from the pasture is not the same during the dry season as during the rainy season with the former offering fewer snails and frogs (thus less protein), and less vegetation and crop residues (thus less minerals and vitamins). Lacking nutrients should be supplemented in the feed during such periods. If it is not possible to produce or purchase a supplemental feed, the size of the flock should be reduced to provide sufficient nutrients to the remaining chickens.

The following items can be used as supplemental feed. They can be saved, found or planted to provide better year-round feed:

- Fresh kitchen food waste (without mould!)
- Cereals, cereal by-products, oilseeds, oilcakes
- Roots and tubers
- Fruits, shrubs and trees
- Nutritious leaves (e. g. amaranth, moringa, cowpea)
- Aquatic plants
- Insects, worms and other small animals found outside

4.5.5 Feeding during moulting

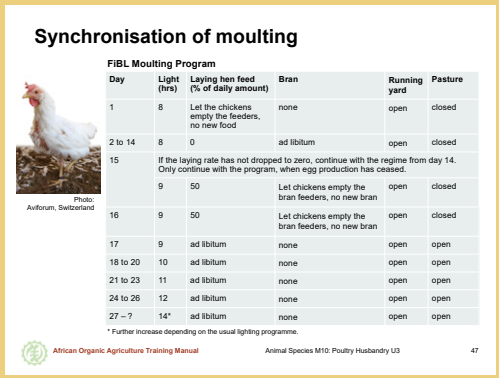
During moulting, chickens renew a large part of their plumage by shedding old feathers and re-growing new ones. Signs of moulting include cessation of laying activity, ruffled re-growing plumage, and many loose feathers on the ground of the chicken house and run.

Moulting is necessary because feathers wear out over time, becoming less able to shed water to keep the bird warm. However, moulting is an energy-intensive time for the birds, as extra nutrients are needed to grow the new feathers. Providing the correct nutrition is critical during this time to allow the birds to moult successfully, recover, and lay again in the following laying period. In addition to good nutrition, special care should also be taken to keep birds busy (e. g. scratching for food, pasture access, etc.) to avoid problems with feather pecking and cannibalism as the shiny, new feathers emerge (see chapter 5.6 A note on feather pecking and cannibalism).

In addition to feeding the complete nutritional requirements of the birds, some additional sources of nutrients should be offered in separate containers at free choice to ensure the birds remain healthy and productive:

- Brewer's yeast: contains methionine (an amino acid that is extremely important and often lacking in a standard diet) and many minerals and vitamins.
- Calcium source (e. g. shell grit)
- Protein source (e. g. insects or fish meal)
- Vitamin source (e. g. freshly cut grasses, herbs, vegetables, fruit)
- Small amounts of wheat sprouts

ARTIFICIAL INITIATION OF MOULTING


Synchronisation of moulting

FiBL Moulting Program

Day	Light (hrs)	Laying hen feed (% of daily amount)	Bran	Running yard	Pasture
1	8	Let the chickens empty the feeders, no new food	none	open	closed
2 to 14	8	0	ad libitum	open	closed
15	If the laying rate has not dropped to zero, continue with the regime from day 14. Only continue with the program, when egg production has ceased.				
	9	50	Let chickens empty the bran feeders, no new bran	open	closed
16	9	50	Let chickens empty the bran feeders, no new bran	open	closed
17	9	ad libitum	none	open	open
18 to 20	10	ad libitum	none	open	open
21 to 23	11	ad libitum	none	open	open
24 to 26	12	ad libitum	none	open	open
27 – ?	14*	ad libitum	none	open	open

* Further increase depending on the usual lighting programme.

Photo: Aviforum, Switzerland

African Organic Agriculture Training Manual Animal Species M10: Poultry Husbandry U3 47

Synchronisation of moulting

After a laying period of one year, the shell quality of the eggs continuously decreases. Instead of replacing the hens, the laying period can be extended by 6 to 8 months by allowing the hens to moult.

Naturally, the hens of a flock moult staggered by some days to weeks. This can lead to increased feather pecking and cannibalism. Artificial initiation of simultaneous moulting can reduce this behaviour.

Artificial initiation of moulting is only possible in stables with electric light that allows the artificial control day length. Initiation of moulting should only be attempted in healthy flocks! Sick or weak animal will suffer or die during moulting and will not perform better after moult.

To artificially induce the moult, the duration of light is reduced and low-energy food is fed for 14 days, or until all hens stop laying following the program below:

Day 1:

- Reduce the light period in the stable to 8 hours, and maintain this duration for 14 days.
- Close the access to the pasture. The hens should not scavenge but only eat their feed in the stable. If there is a small run yard with gravel, concrete, sand, bare earth, wood chips, without scavenging opportunity, the pop holes can remain open during the day.
- The hens should finish the remaining layer feed. Do not re-fill the feeders.
- Do not remove the calcium source (shell grit)! All hens should have free access to it at all times.

Days 2 to 14:

- Offer as much bran as the hens can eat instead of the layer ration.
- Make sure that calcium is always available, as the hens have to refill their calcium reserves for the next laying cycle.
- Make sure that all hens have access to clean water at all times.

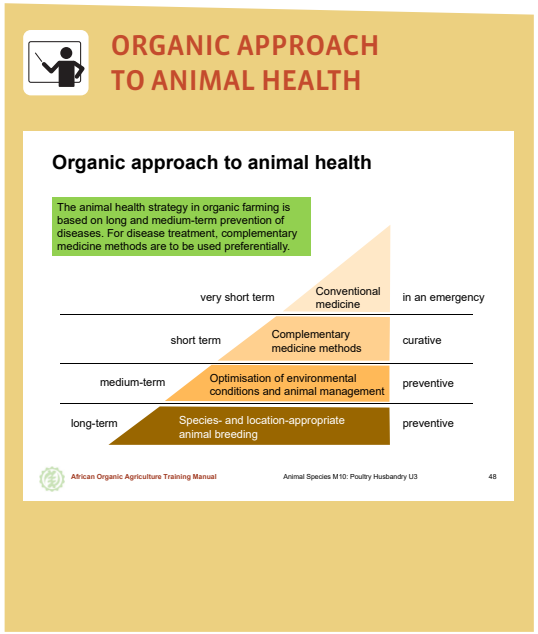
When laying activity is down to zero:

- Increase the light period step-by-step over two weeks: 3 days of 9 hours, 3 days of 10 hours, 3 days of 11 hours, 3 days of 12 hours, then 14 hours, and – depending on the normal day length – possibly further increase (not longer than 16 hours).

Discussion on possible by-products for poultry feeding

Discuss in groups which local by-products can be used as poultry feed. Then, characterise the products together and discuss their pros and cons regarding poultry feeding.

- Source: a) own farm, b) nearby farms c) local businesses, d) market
- Feed value: group by energy and protein
- Add current prices and availability
- How can the components can be integrated in poultry production (e.g. How are they fed? Do they need to be boiled or roasted?)?
- Is there any risk related to the use of these by-products (animal health, availability, price)?
- What are the challenges in sourcing organic feed materials and how can these be overcome?



› Return to feeding the layer ration over 3 days and stop refilling the bran: 2 days with 50 % of the normal daily layer ration, from the third day onwards as much as the hens want to eat ("ad libitum").
› As soon as the hens receive their normal daily layer ration, give access to the chicken pasture again. Hens are now allowed to scavenge freely.

5. Health and disease

5.1 Why prevent disease

Maintenance of health in organic poultry farming primarily relies on the long and medium-term prevention of diseases and health problems. These can include those caused by infectious agents, the birds' environment and nutrition, stress, and genetic factors. Besides being a cornerstone of organic farming, disease prevention ensures both human and animal safety, animal welfare, and ultimately better profits for farmers.

Preventing disease in poultry helps prevent the spread of zoonotic diseases (diseases spreading from animals to people or vice versa). These include diseases like salmonella, a bacterium that lives in the intestines of poultry and is spread in the faeces. The bacterium usually causes no symptoms in the birds, however, in humans, salmonellosis (the most common cause of "food poisoning") causes diarrhoea and fever, and sometimes more severe symptoms. Other diseases such as Highly Pathogenic Avian Influenza (HPAI; in humans commonly known as "bird flu"), a virus that infects the birds and is spread through the faeces and respiratory secretions, can cause severe disease and death in both poultry and humans. Therefore, prevention of disease helps to keep the animals, the farmers and the community safe.

Disease prevention also ensures animal welfare by preventing painful and debilitating disease, injuries, and death. This not only shows respect for the animals and the goods and services they provide, but is also practical. While disease prevention may require time for flock observation and cleaning, it leads to considerable time and cost savings in the long run.

When a disease occurs in a flock, farmers must act quickly. They will have to put all routine tasks aside to quarantine sick birds, perform detailed observations of symptoms, and contact a veterinarian, community animal health worker

PILLARS OF HEALTH PREVENTION

Pillars of flock health and disease prevention

Breed known for their good health and productivity; **healthy birds**	Proper **nutrition**, clean water, little stress	**Biosecurity measures** that minimise the entry and spread of diseases
Housing with good ventilation, sufficient space, and an **outdoor area** allowing natural behaviour	**Clean and dry environment** free of mould and droppings	**Vaccination program** for the farm
	"All-in/all-out" management	Quick and appropriate **action** in case of problems

or neighbour knowledgeable in poultry health. Ideally, a diagnosis of a curable disease is made and organic-approved medications are administered. Where organic-approved medications are not available or effective enough, synthetic medications should be used in interest of the animals.

In case of diagnosis of a non-curable and highly infectious disease, all the birds must be culled and all the premises must be thoroughly cleaned and disinfected. Such incidents are stressful, time-consuming and costly.

Careful prevention of diseases also reduces the need for the use of antibiotics on a regular basis. While the prophylactic use of antibiotics and other conventional medication to prevent problems is not allowed in organic production, their curative use is permitted when natural remedies do not have the required efficiency. However, it is important to note that each time antibiotics are used, resistent bacteria are selected. Over time antibiotics become less effective, or even ineffective, especially, if the antibiotics are not applied properly. Antibiotic resistance is increasing worldwide, both in animals and humans, and is becoming a problem in human health management. The best prevention of antibiotic resistance on a farm is to minimise the use of antibiotics by implementing proper prevention measures against diseases.

5.2 The keys to a healthy flock

A good management system is the key to a healthy and productive flocks. A good management system ensures both healthy and disease-resistant birds and a clean, safe and healthy environment for animals and humans. The pillars of flock health and disease prevention are:

- Healthy birds that are bred for good health and productivity (Chapter 6)
- Proper nutrition, clean water and little stress (Chapters 2, 3 and 4)
- Housing with good ventilation, sufficient space, and an outdoor area allowing natural behaviours (Chapter 3)
- Robust cleaning procedures that ensure a clean and dry environment free of mould and droppings (Chapter 3.7)
- If possible, an "all-in/all-out" management strategy (Chapter 5.2.1)
- Biosecurity measures to minimise entry and spreading of diseases on the farm (Chapter 5.2.2)
- Quick identification of problems and appropriate action (Chapter 5.3)
- Vaccination program (Chapter 5.4)

5.2.1 All-in/all-out management

The "all-in/all-out" management method is recommended, where possible. The method relies on the introduction and removal of entire flocks. Between flocks, a thorough cleaning and disinfection of the empty house is performed. The cleaned facility is then stocked with birds of the same age. All animals of the flock will stay in the facility either until they reach slaughter weight in the case of broilers, or the end of the laying period in the case of layers. Then, all the birds are removed, and the facility is cleaned and disinfected before the next flock is brought in. Flocks with animals of different ages is only recommended for mother hens with chicks.

One of the main advantages of the "all-in/all-out" method is the reduced risk of disease introduction by new birds that are added to the flock. This method is not applicable in all cases, but the idea should be considered when planning the facilities.

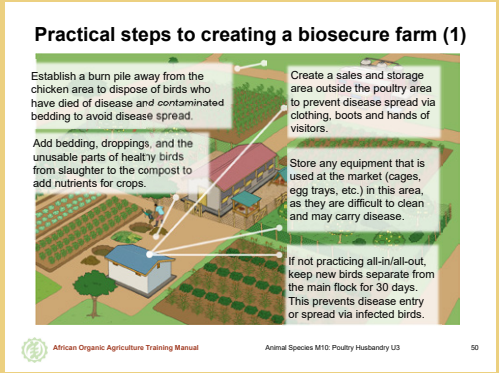
5.2.2 Biosecurity measures

Biosecurity measures aim to prevent diseases from entering the farm, and from spreading within the farm. The all-in/all-out method discussed above is one example of a biosecurity measure. Biosecurity measures do not need to be complicated, but do need to be fully understood and strictly followed by the farmer, workers and visitors in order to be fully effective.

How do diseases enter and spread on the farm?

- In or on new purchased birds (infected eggs, chicks or adult birds)
- On hands, shoes, clothing or vehicles of visitors that have been on or in contact with sick or infected birds
- On hands, shoes, clothing or the vehicle of a veterinarian or animal health worker that has been in contact with sick or infected birds
- In or on wild birds, neighbourhood poultry, or other wild or domestic animals (i. e. cats, dogs, mice) that have been in contact with or fed on sick or infected birds and interact with the flock
- On hands, shoes, clothing or equipment used by the farmer as he/she travels between pens of birds
- In feed or feed components bought in or stored on the farm under unhygienic conditions
- Via biting insects, mites or ticks that have visited sick or infected birds

BIOSECURITY MEASURES (1)

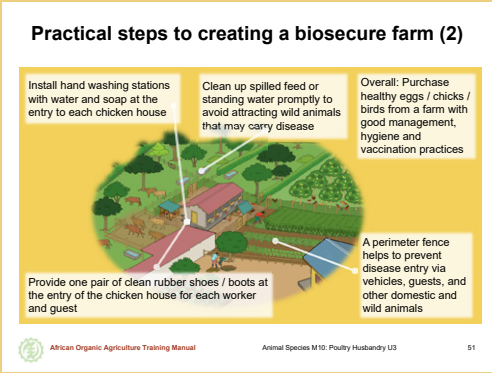


Because diseases caused by viruses, bacteria and parasites can easily enter a farm in various ways, these are often undetected. Nevertheless, all possible measures should be devised to minimise the entry of diseases. While it may not be practical or possible to implement all measures on a farm, farmers should try to implement as many biosecurity measures as possible.

General biosecurity recommendations

- **Establishment of a burn pile:** The establishment of a burn pile far enough from the chicken facility that the smoke will not blow in allows to dispose of birds who have died of disease and of contaminated bedding from those birds to avoid disease spread.
- **Composting:** Used bedding, droppings and the unmarketable parts of healthy birds from slaughter (feathers, beaks, etc.) can be composted and turned into a valuable fertiliser for crops. Care needs to be taken that wild birds and other predators and scavengers are excluded from the compost pile, as they can transmit undetected diseases.
- **Sales area outside the farm:** If sales of birds or eggs, or other products are done from the farm, the sales area should be set-up outside the perimeter fence of the farm. This reduces the risk of disease entry via clothing, boots and hands of visitors.
- **Cleaning of all equipment used outside the farm:** If sales are done from a market, all equipment (i.e. cages, egg trays, etc.) needs to be thoroughly cleaned, disinfected, and dried before entering the “clean” part of the farm. Used cardboard egg trays should not be introduced into the farm, as they may be contaminated and cannot be properly cleaned.
- **Quarantine house:** If no all-in/all-out method is practiced, a quarantine house should be established where new birds can remain separated from the main flock for 30 days.
- **Secure sources of supply:** Only healthy eggs, chicks and birds should be purchased from a farm with good management, hygiene and vaccination practices.
- **Perimeter fence:** A perimeter fence should be installed around the chicken house and the outdoor run to prevent disease entry on the tires of dirty vehicles, dirty clothing and footwear of guests, free-range poultry, dogs and cats.
- **Separate housing of different species:** Birds of different species (e.g. ducks, chickens) should be housed separately.

BIOSECURITY MEASURES (2)



- **Washing stations:** Hand washing stations with water and soap should be installed at the entry of each chicken house.
- **Clean shoes/boots:** A pair of clean rubber shoes/boots should be available at the threshold for entering the chicken area for each worker and guest. Before entering the facility, everyone needs to change from the "dirty" outside shoes to the "clean" rubber shoes inside. The rubber shoes/boots should be cleaned and disinfected regularly.

Observing the flock daily for signs of disease allows for rapid detection and ideally allows the farmer to quickly quarantine sick birds, consult a veterinarian or community animal health worker, diagnose, and treat the disease before it becomes severe with natural remedies before synthetic drugs such as antibiotics are required.

Biosecurity should be made a key element of the farm's routine by following the following steps:

Daily biosecurity checklist for poultry farmers:

- **Starting with the youngest birds:** In case of more than one flock on a farm, work (feeding, cleaning, etc.) should always start with the youngest birds, the older birds, and end with new birds to the farm and finally sick birds. Such a procedure prevents disease spread within the farm from older animals to chicks, who are more susceptible to disease.
- **Removal of spilled feed:** Any spilled feed from indoor or outdoor areas needs to be removed. This helps to prevent disease entry via wild birds or other animals like rats and mice looking for food.
- **Removal of standing water:** Standing water surfaces from indoor or outdoor areas should be removed. This helps to prevent disease entry and spread by infected stinging insects.
- **Check for illnesses:** All chickens should be checked daily for illness. Chickens who appear ill should be isolated promptly. This prevents spread of the disease to healthy animals (see Chapter 5.4).
- **Disposal of dead chickens:** Chickens that died from illness must be disposed of by burning. They should never be eaten or fed to other animals. If many birds have died and veterinary services are available, the dead birds should be taken to the office to determine the cause of death. This is necessary to decide on the further steps to control the disease.

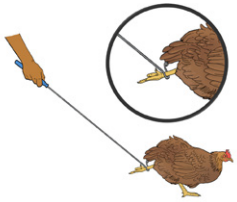
Discussion on biosecurity measures

Discuss in groups the implementation of biosecurity measures on the participants' farms. Invite the participants to discuss the following questions:

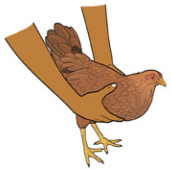
- What biosecurity challenges have you faced, and how have you dealt with them?
- Which biosecurity measures have you implemented, which not?
- What new biosecurity measures might you consider after this training?

CATCHING CHICKENS

How to catch chickens



Using a hook when catching chickens can make it much more easy and less stressful for animals and people.



Chicken are best picked up from behind by grasping the body of the animal with the hands from both sides.

5.3 Handling of the birds

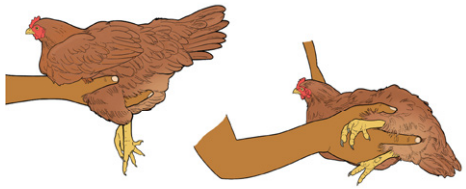
Chickens are easily stressed. Therefore, good handling is necessary to prevent problems in production, health and product quality.

Chickens should get used to humans from an early age. Inspections of the animals at least twice per day should be combined with gently handling individual birds. Birds who are handled from a young age will be easier to examine and less prone to stress later on.

Any bird that shows signs of illness or injury should be individually handled and inspected. If the chickens are used to being caught and don't tend to panic, they can be picked up gently by placing one hand over each wing to prevent excessive flapping. If a bird cannot be easily caught, a tool such as a catching grid or a poultry hook can be used to catch individual birds without disturbing the flock too much. For close inspection, one can rest the chicken on a hand and forearm while maintaining a gentle but firm grip on the chickens' legs so that it can't escape.

HOLDING CHICKENS

How to hold chickens



Holding chickens properly

BUILDING A CATCHING GRID

How to build a catching grid

Attach wire mesh to a (metal) frame

Attach several frames to each other

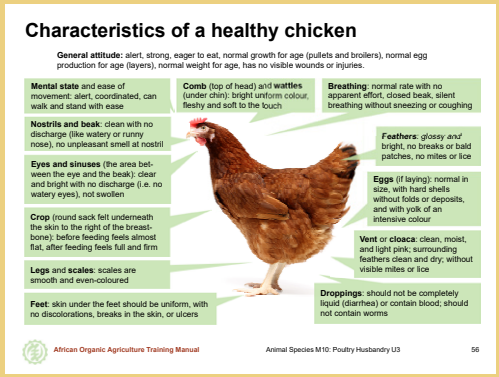
Photos: Christiane Keppler

USING A CATCHING GRID

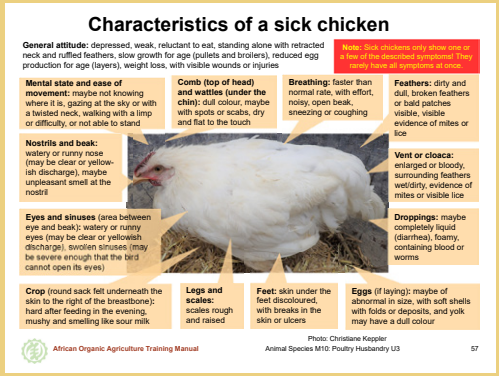
How to use a catching grid

Photo: Christiane Keppler

HEALTHY CHICKEN



SICK CHICKEN



If a larger number of birds need to be caught, for example for selling or slaughtering, they are best picked up from their perches at night, using as little light as possible. A small headlamp is a helpful tool for this job, at best with blue light. Hens are quiet when roosting, and will not run away.

Note: Chickens get short of breath when carried upside down. Therefore, they should either be picked up one at a time as described above, or if they must be carried by the feet, this should not be done for more than a few steps or seconds. Chickens don't have a midriff as we do, so their intestines fall into their ribcage when upside down, leading to problems breathing and potential suffocation.

5.4 Daily flock health observation

At the daily observation of the chickens for signs of illness, the observations should be performed in two steps. In a first step, the group or flock is observed from a distance, in a second step, individual birds are examined more closely.

5.4.1 Observation of the flock

Routine inspections include walking slowly through the flock and observing the chicks for any divergence in behaviour and visible health impairments. Another occasion for checking the behaviour of the animals is after fresh food and water have been provided. For this observation, one should stand still and relaxed at the side of the pen in order to not disturb, distract or frighten the chickens.

Because chickens are flocking animals, they will attempt to hide any weaknesses or disease symptoms and stay with the flock, if they feel threatened by human presence. If not frightened, they tend to explore everything new, which includes the observer, when entering the pen. Depending on the flock, it may take 5 to 10 minutes for them to relax or lose interest and display their natural behaviours. Patience is rewarded when one can see issues in the flock, and if any birds need to be more closely examined.

During routine inspections, one should always look for unfit birds in darker corners, the nests and on elevated perches, as sick chickens tend to withdraw from the flock.

POULTRY DROPPINGS

During the day, healthy chicken **should be**:

- Eager to approach food and clean water and consume a constant amount of food and water.
- Showing natural behaviours such as scratching, dust bathing, preening.
- Alert to their environment.
- Breathing with a closed beak – unless it is very warm, when birds will breathe with a slightly open beak to cool off. This is also usually accompanied by slightly outstretched wings.
- Able to move freely without signs of limping or inability to stand.
- Free of obvious injuries (e. g. signs of feather pecking or blood).
- Growing at the proper rate for their age (pullets and broilers).
- Producing good quality eggs at the proper rate for their age (layers).
- Having the appropriate body weight for their age. All the animals of a flock should have similar weight.

Birds **should not be**:

- Unaware that fresh food and water are available or appear listless or unaware of their environment.
- Standing alone with fluffed feathers, retracted neck, and closed eyes.
- Sneezing or coughing.
- Breathing with an open beak (if not trying to cool down).
- Limping or unable to stand.
- Obviously injured (feathers or skin pecked, bloody).

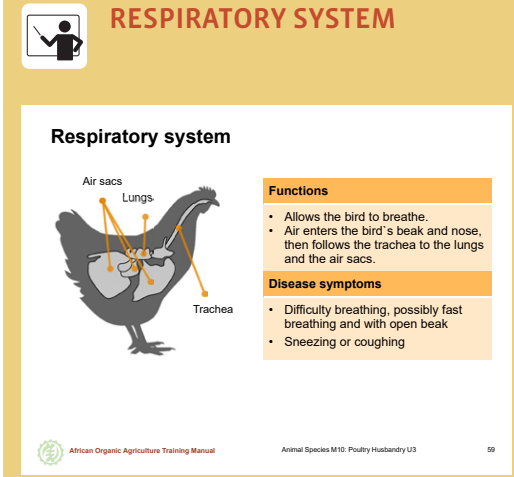
5.4.2 Inspection of individual birds

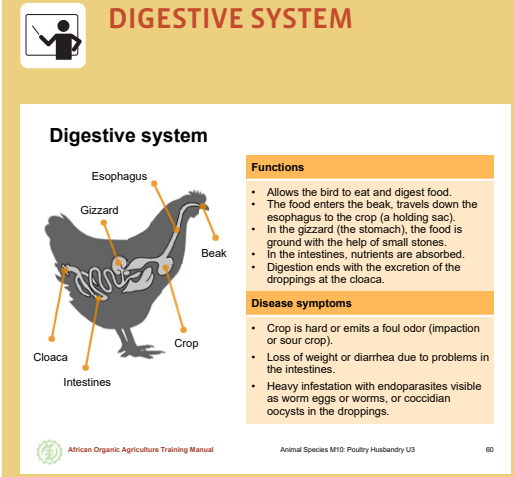
At least once a week, several chickens should be caught for a closer inspection. Additionally, if any signs of unhealthy birds are noticed during flock inspection, a closer examination of the affected birds is required. The inspected birds should be caught and handled with care to avoid further stress or injury. The observations should be noted on a piece of paper. The characteristics of a healthy and a sick bird are shown on the slides.

Discussion on health observations

Discuss in groups what kinds of health observations the farmers have made. Ask them the following questions:

- What daily checks do you carry out in your flocks. If you do not perform any, would you now consider doing it? Why or why not?
- What kinds of symptoms have you observed with sick birds, and what did you do about them?
- Do you keep records of sick birds, symptoms, and any birds treated with antibiotics or other synthetic medications?
- Do you use any natural or other remedies you have found helpful?
- What are some major health challenges to your flock that you have not yet found a suitable solution for?





5.5 Body systems affected by disease

Diseases may affect one or several of a bird's main body systems. The following is a brief introduction to those systems.

Respiratory system

This system allows the bird to breathe. The air enters the bird's beak and nose, then follows the trachea to the lungs and to the air sacs.

When this system is affected, the bird will have difficulties breathing, may sneeze or cough, and may breathe rapidly and with an open beak.

Digestive system

This system allows the bird to eat and digest food. Food enters the beak, travels down the oesophagus to the crop (a holding sac), is ground in the gizzard (the stomach) with the help of the gizzard stones, passes to the intestines for absorption of nutrients and water, and ends as droppings at the cloaca.

When this system is affected, there may be a crop problem where food becomes stuck and/or the crop is infected (impaction or sour crop), or the issue may be further down in the intestines. In this case, the bird may lose weight or have diarrhoea. The veterinarian or health worker may also detect too many worm eggs (or sometimes worms) or many coccidian oocysts in the droppings.

Nervous system

This system allows the bird to be alert and conscious, react to its environment, and it controls and coordinates muscle movement. It is controlled by the brain, which receives messages from nerves running throughout the body.

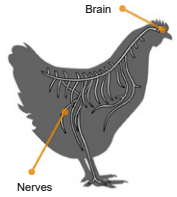
When this system is affected, the bird may appear to not know where it is, and muscle movement may be affected (either the neck is bent backwards, or the bird has trouble walking or cannot walk).

Musculoskeletal system

This system provides the bird's body with its skeletal structure for support and muscles and joints for movement. When this system is affected, birds may have difficulty or be unable to move, may have affected joints (i. e. swollen) or have affected bones (i. e. thickened or broken).

NERVOUS SYSTEM

Nervous system



Functions

- Allows the bird to be alert and conscious, react to its environment.
- It also controls and coordinates muscle movements.
- The nervous system is controlled by the brain, which receives messages from nerves.

Disease symptoms

- Lack of orientation
- Disturbed muscle activity (neck bent backwards, difficulties walking)

Integumentary system

This system encompasses the bird's external body, including skin, feathers, beak, and legs.

When this system is affected, the bird's skin may be itching or have wounds or show damages. The bird may lose feathers or have reduced feather health, or uneven and raised scales may be visible on the legs/feet.

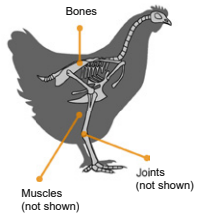
Reproductive system

This system allows female birds to create and lay eggs. It begins at the ovary, and the egg is assembled as it travels down the oviduct. After 24 hours, a complete egg is laid through the cloaca.

When this system is affected, egg production or egg quality may be reduced. Eggs may have irregular or no shells, deposits on the shell, or have abnormal contents inside.

MUSCULOSKELETAL SYSTEM

Musculoskeletal system



Functions

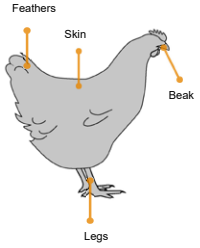
- Skeletal structure of the body for support
- Muscles and joints for movement

Disease symptoms

- Difficulty or inability to move
- Affected (i.e. swollen) joints
- Affected (i.e. thickened or broken) bones

INTEGUMENTARY SYSTEM

Integumentary system



Functions

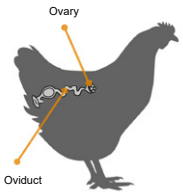
- Encompasses the bird's external body, including skin, feathers, beak, and legs.

Disease symptoms

- Itching skin
- Wounds or damages to the skin
- Loss of feathers or reduced feather health
- Uneven and raised scales on the legs/feet

REPRODUCTIVE SYSTEM

Reproductive system



Functions

- Allows female birds to create and lay eggs.
- It begins at the ovary.
- The egg is assembled as it travels down the oviduct.
- After 24 hours, a complete egg is laid through the cloaca.

Disease symptoms

- Reduced egg production
- Reduced egg quality (irregular or no shells, deposits on the shell, or with abnormal contents)

FEATHER PECKING AND CANNIBALISM

SIGNS OF FEATHER PECKING AND CANNIBALISM

5.6 A note on feather pecking and cannibalism

Some injuries noted during the daily health inspection may not be caused by disease, but by the behaviour of the chickens themselves. It is important to also observe the behaviour of the chickens. If blood, missing or damaged feathers, or pecked dead birds are noticed, or if birds are observed that are pecking at each other or pulling out feathers from each other, these are indications of problems with feather pecking or cannibalism.

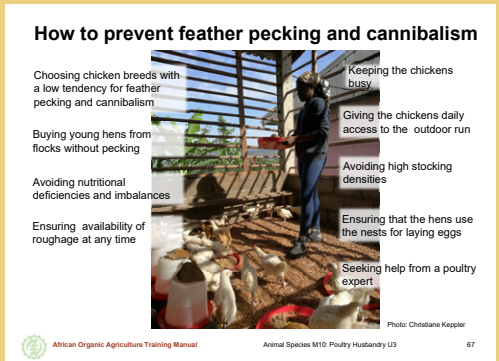
Some pecking is a normal behaviour of the chickens to establish hierarchies in the flocks. This type of pecking is directed to the other chickens' heads and combs. Normal pecking should not cause serious injuries as long as the pecked chickens have enough space to evade.

In contrast, feather pecking and cannibalism are not related to establishing hierarchies, and because these behaviours can cause serious injury or death, they should be noted and prevented in the flock. Also, chickens learn these behaviours from others. This is why such behaviours must be quickly identified and stopped.

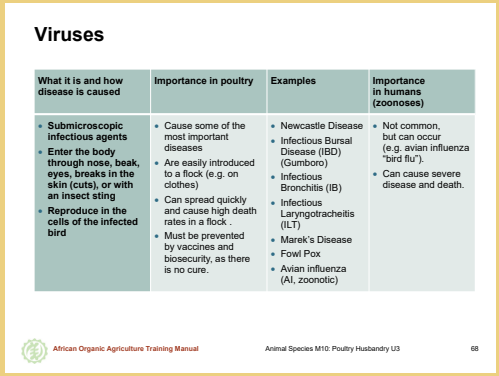
Recommendations for reducing feather pecking and cannibalism

- Choose chicken breeds with a low tendency for feather pecking and cannibalism. Often, more nervous or more active chickens also have a higher tendency for these unwanted behaviours.
- Unwanted behaviours like feather pecking and cannibalism can develop already at an early age (e.g. between 2 and 4 weeks of age). Once the chicks "learned" that behaviour, they tend to do it again whenever they feel stressed. Therefore, young hens should be bought from experienced poultry farmers with species-appropriate husbandry and feeding according to requirements of the growing up birds.
- Injurious pecking derives from searching for food. It can be a consequence of nutritional imbalances. Therefore, poultry farmers should ensure that the nutritional needs of the adult chickens are fulfilled.
- Pulling and eating of feathers can derive from a lack of roughage. Therefore, availability of roughage should be ensured at any time.
- Keeping the chickens busy distracts them from pecking each other. For example, one can spread grains into the litter and offer feed like carrots and fresh or dried plants (alfalfa or others) without shredding them first. Giving small

PREVENTION OF FEATHER PECKING AND CANNIBALISM



VIRUSES



portions each day instead of spreading too much food into the litter prevents mould.

- Feather pecking and injuries should be checked regularly. It is important to take measures against it as soon as pecking occurs. Chickens with bleeding wounds should be separated from the rest of the flock immediately. Even if the bleeding wound has not been caused by pecking, it tempts other chickens to peck at it.
- Unexperienced poultry farmers should start with low stocking densities, as the risk of cannibalism is much higher in flocks with high densities.
- Laying hens should be encouraged to use the nests. When laying an egg, the egg comes out of the cloaca and the cloaca is moist and shiny. If this happens outside the darker and secure nest, other hens might confuse the shiny cloaca with something edible and start to peck it.
- If the problem is already severe, a quick measure is the reduction of light. However, if hens are kept from pecking each other by dimming the light, they will usually start pecking again as soon as it is brighter again. Therefore, in severe cases, the problem is usually irreversible for that flock.

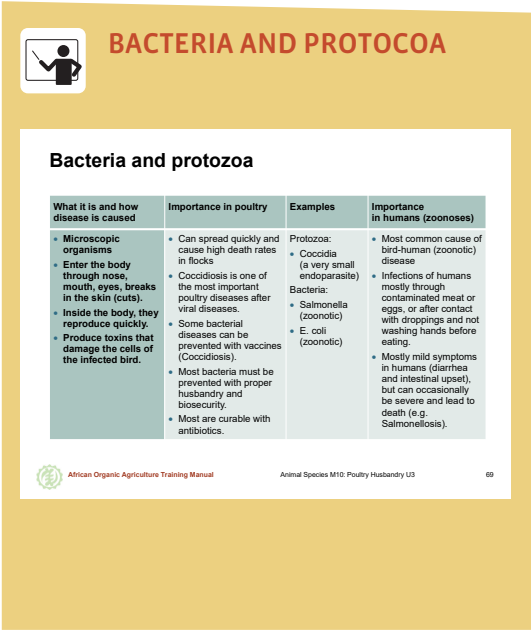
5.7 Common disease agents

In this chapter, different disease agents of poultry are presented, along with examples of the agents that are important in poultry farming. For each agent, it is explained what the disease is, how it enters the body, and how it causes disease. The importance in poultry health is described, and possible prevention and treatment methods are outlined. Then, zoonotic diseases are described that can pass from chickens to people.

The examples presented for each agent are listed in order of importance to poultry farming. Diseases that appear high on the list occur commonly, and can have high death rates in a flock. For example, among the viruses, Newcastle disease is listed first as it is currently the primary viral disease of concern in African poultry farming.

Viruses

Viruses are smaller than microscopic organisms. They can enter the body through the nose, the beak, the eyes, breaks in the skin (cuts), or be transferred with an insect sting. Inside the body, viruses reproduce in the cells, causing disease symp-



toms. Viruses are causing some of the most important diseases among poultry because:

- They can easily be brought into a poultry house (e. g. on the clothes of people coming from another poultry facility).
- They can spread quickly and cause high mortality (death) in a flock.
- They must be prevented by vaccines and biosecurity, as there normally is no cure against it.

The major viruses that infect poultry are Newcastle Disease, Infectious Bursal Disease (IBD) (a.k.a. Gumboro), Infectious Bronchitis (IB), Infectious Laryngotracheitis (ILT), Marek's Disease, Fowl Pox, and Avian influenza (AI, zoonotic).
Although viral infections from birds to humans are not common, they can occur – for example with avian influenza caused by the virus H5N1, also called "Bird flu". In humans "Bird flu" can cause severe disease and even lead to death.

Bacteria and protozoa

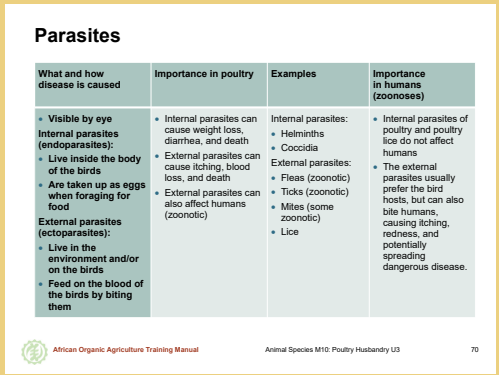
Bacteria and protozoa are microscopic organisms that enter the body through similar routes as viruses. Once inside the body, they reproduce quickly, and release toxins that damage the cells of the infected bird, causing signs of disease.

Bacteria and protozoa are of next highest importance after viruses because:

- They can spread quickly and cause high mortality (death) in a flock (for example, coccidiosis is one of the most important poultry diseases after viral diseases)
- In some cases, they may be controlled by vaccines (Coccidiosis), but mostly, infections must be prevented by proper husbandry and biosecurity.
- Most bacterial infections are curable with antibiotics. However, antibiotics must be used strictly according to veterinary instructions to prevent resistances of the bacteria on a medium or long term. Some organic regulations define specific waiting periods after use of antibiotics, during which the products cannot be sold as organic.

The most important example of protozoa are coccidia (a very small endoparasite that can cause heavy losses in flocks, particularly in young animals). Examples of bacteria are salmonella and E. Coli. Both bacteria can be zoonotic, meaning that they can be transmitted to humans.

PARASITES

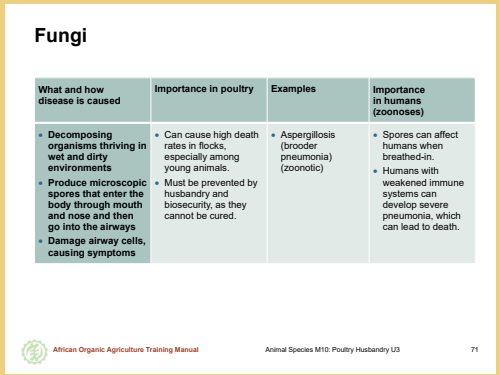


Parasites

What and how disease is caused	Importance in poultry	Examples	Importance in humans (zoonoses)
• Visible by eye Internal parasites (endoparasites): • Live inside the body of the birds • Are taken up as eggs when foraging for food External parasites (ectoparasites): • Live in the environment and/or on the birds • Feed on the blood of the birds by biting them	• Internal parasites can cause weight loss, diarrhea, and death • External parasites can cause itching, blood loss, and death • External parasites can also affect humans (zoonotic)	Internal parasites: • Helminths • Coccidia External parasites: • Fleas (zoonotic) • Ticks (zoonotic) • Mites (some zoonotic) • Lice	• Internal parasites of poultry and poultry lice do not affect humans • The external parasites usually prefer the bird hosts, but can also bite humans, causing itching, redness, and potentially spreading dangerous disease.

African Organic Agriculture Training Manual Animal Species M10: Poultry Husbandry U3 70

FUNGI



Fungi

What and how disease is caused	Importance in poultry	Examples	Importance in humans (zoonoses)
• Decomposing organisms thriving in wet and dirty environments • Produce microscopic spores that enter the body through mouth and nose and then go into the airways • Damage airway cells, causing symptoms	• Can cause high death rates in flocks, especially among young animals. • Must be prevented by husbandry and biosecurity, as they cannot be cured.	• Aspergillosis (brooder pneumonia) (zoonotic)	• Spores can affect humans when breathed-in. • Humans with weakened immune systems can develop severe pneumonia, which can lead to death.

African Organic Agriculture Training Manual Animal Species M10: Poultry Husbandry U3 71

Bacteria are the most common cause of disease transmitted to humans from birds. Humans are usually infected by eating contaminated poultry products like meat or eggs, or after contact with infected birds or droppings and not washing the hands before eating. Although the disease symptoms in humans are usually mild (diarrhoea and intestinal upset), the infections can occasionally become severe and lead to death (e. g. salmonellosis).

Parasites

Parasites can be detected without a microscope, but their eggs are microscopically small.

Internal parasites (endoparasites) live inside the body of the birds. The birds take them up as eggs when foraging for food. External parasites (ectoparasites) live in the environment and/or on the birds. They feed on the blood of the birds by biting them (fleas, ticks, red mites) or on the dead skin and feather cells (lice, mites).

Parasites are of the next highest importance after viruses and bacteria because:

› Internal parasites can cause weight loss, diarrhoea, and death.
› External parasites can cause itching, blood loss, and death.
› External parasites, although they usually prefer their bird hosts, can also affect humans (zoonotic diseases) causing itching, redness, and potentially spreading diseases. Internal parasites of poultry and poultry lice do not affect humans.

Examples of internal parasites are Helminths and Coccidia. Examples of external parasites include fleas (zoonotic), ticks (zoonotic), mites (some zoonotic), and lice.

Fungi

Fungi are decomposing organisms that thrive in wet and dirty environments (i. e. like a dirty chicken house). They produce spores, which are microscopic particles that enter the body through the mouth and nose and then travel into the airway. There they damage airway cells, causing signs of disease.

Sharing of experiences of diseases

Invite the participants to discuss in groups what kinds of diseases they have experienced on their farms. Ask them the following questions:

› What types of diseases have you experienced on your farm – viral, bacterial, etc.?
› Which diseases of the different types have occurred most?
› How did you treat these diseases and what was the outcome?
› What advice do you have for other producers in terms of identifying, treating, and preventing diseases?

Ask the groups to present their answers to the others. Draw conclusions together for the prevention, identification and treatment of diseases in poultry production.

These organisms are important because:

- They can cause high mortality (death) in a flock, especially when young animals are exposed.
- They must be prevented by husbandry and biosecurity, as there is no cure in case of infection.

An example of a fungal disease is Aspergillosis (brooder pneumonia), a zoonotic disease. The spores of this fungus can affect humans that breathe them in, especially those with weakened immune systems. These people can develop severe pneumonia, which can lead to death.

5.8 Handling diseases in flocks

When animals with disease symptoms are noticed in a flock, the required actions may depend on the agent. However, it is always recommended to quarantine and examine affected birds more closely and to consult a veterinarian or extension worker if the cause of symptoms is not clear.

If animals do not eat properly, electrolytes, vitamins and minerals should be added to the drinking water to prevent dehydration. If the crop of a bird feels hard, one can gently massage it to break up the impacted roughage.

Viral diseases

Viral diseases cannot be treated. To avoid further distribution of the disease to other animals, immediate measures such as quarantine of diseased animals and disinfection of the poultry house must be taken together with the veterinarian. In case of viral infection, farmers should discuss a vaccination plan and review biosecurity procedures to prevent further spreading of the disease and future infections.

Bacterial diseases

Most bacterial diseases can be cured with antibiotics. For an effective treatment of a bacterial infection, the agent of the disease must be determined together with the veterinarian. The antibiotic is then prescribed by the veterinarian with indication of the dosage and the duration of the treatment.

Note: Antibiotics must be applied by the farmers as prescribed, because incorrect (too low) dosage and a too short treatment are the main reason for antibiotic resistance of bacteria! Also, the antibiotic substance should not be changed during an application cycle. In certified organic production, specific withdrawal guidelines may apply, and it may be necessary to keep records of the treatment.

Parasitic diseases

Parasitic diseases can be cured or prevented by vaccination in the case of coccidioses. If the purchased chicks are not vaccinated, farmers should discuss vaccination against coccidioses with the veterinarian.
Worms can be treated with anthelmintics that are administered during several days either in the feed or in the drinking water. As for other medicines, anthelmintics must be applied as prescribed to avoid development of resistance.

To prevent external parasites such as poultry red mites, common hygiene measures are most important. As soon as these mites are detected as small red spots in cracks of the poultry house or under perches, the inside of the house should be treated with diatomaceous earth. "Hot spots" with many mites can additionally be treated with ordinary household oil or with a natural acaricide (e. g. pyrethrum or Neem extract).

Fungi

Internal fungal infections cannot be treated, but the load of spores in the air can be reduced by increasing the air flow in the stable and making sure that the environment is dry. Fungi reproduce in wet material, so one should make sure to remove any wet litter and humid fodder residues. A disinfection and husbandry plan can be useful to prevent further fungal disease.

Nutrient deficiencies

Nutrient deficiencies that cause diseases can usually be treated, although some birds may suffer permanent effects. In case of deficiencies, the farmer and the veterinarian can review the feeding protocols to determine what elements might be missing or in excess (for more details, see chapter 4: "Feeding and drinking").

5.9 Flock vaccination

Viral diseases and coccidiosis currently are the major threats to poultry production in Africa. Vaccines play a critical role in preventing and minimising these diseases. Which vaccines a farm requires depend on:

- the prevalent diseases in the area,
- the type of flock (broiler, layer, dual-purpose),
- the age and vaccine status of the birds upon arrival to the farm, as well as
- the cost, availability and storage capacities (many vaccines must be kept in a refrigerator to not lose their effectiveness), and
- the administration of the vaccines themselves,

Note: There is no "one fits all" vaccination plan for poultry. This is why each farm should develop its vaccine plan together with a local veterinarian or animal health worker both to maximise animal health and to stay within organic standards.

The following list is not a definitive vaccine schedule, but a list of vaccines to consider based on the factors mentioned above. It can be used as an aid in developing a vaccine plan with the veterinarian, and deciding where to purchase chicks (i. e. which vaccines are used at the hatchery).

- All farms should buy vaccinated chicks/vaccinate against Newcastle disease and coccidiosis (if available).
- Farms should buy vaccinated chicks/vaccinate based on disease prevalence in their region against:
- Marek's Disease
- Infectious Bursal Disease (IBD) (Gumboro)
- Infectious Bronchitis (IB)
- Infectious Laryngotracheitis (ILT)
- Avian influenza (AI) (zoonosis)

Direct and indirect administration of vaccines

There are two ways for the administration of vaccines: direct and indirect administration.

Direct administration can be done by injection of a vaccine with a needle or in liquid form into the beak or eye of the animal. This method ensures that

each chicken receives the vaccine, but creates high labour costs as each chicken must be handled individually, and can cause injuries in the chickens if done by untrained staff.

Indirect administration can be done, either by exposing the chickens to a vaccine that is dissolved in their drinking water or sprayed in the air/onto the flock. Indirect administration involves low labour costs, but sometimes results in too low vaccination rates, which means the flock is still vulnerable to a disease outbreak.

Timing of vaccinations

Some vaccinations are best applied in the hatchery, because many diseases can affect chicks at a very early age. It is also better to deliver chicks that already have some immunity when they are transferred to the farm.

Some vaccines are only available in larger quantities and/or degrade within hours after opening. Therefore, it makes sense and is more economical to vaccinate large numbers of animals in the hatchery rather than wasting vaccines when vaccinating small numbers of animals on farms.

Some vaccines, however, lose power (efficacy) as chicks grow, and need to be administered again. Repeated administrations of vaccines are called “booster” vaccinations. They must be administered on a specific schedule to young chickens and yearly for mature chickens in order to maintain their effectiveness.

Some vaccines must be given to mother hens at the correct time so that disease immunity (protection) is passed from the mother hen to her eggs.

Because there is no “one size fits all” vaccination plan for poultry, each farm should develop its vaccine plan together with a local veterinarian or animal health worker both to maximise animal health and to comply with the organic standards.

TRADITIONAL BREEDS

Traditional breeds

Breed	Origin	Performance and traits
African Naked Neck	Africa	robust, especially in high temperature regions, good weight gain, egg production and egg quality
Australorp	Australia	good meat chicken with good laying performance; not good at flying
Boschveld	South Africa	robust and disease tolerant, low nutritional needs; good layer
Bresse	France	dual-purpose with good meat quality; early onset of lay, eggs rather small
Kuroiler	India	good egg production and weight gain
New Hamphire	North America	fast growing and early onset of lay
Noiler	Nigeria	good weight gain
Orpington	England	heavy dual-purpose, tendency to become broody
Ovambo	Namibia	high egg and meat production; small and agile
Potchefstroom Koekoek	South Africa	dual-purpose, well suited for free range; sufficiently broody
Rhode Island Red	North America	good dual purpose; early start of laying between 18 and 24 weeks of age
Shika-Brown	Nigeria	good egg production
Silky chicken	China	very good for brooding eggs and good mothers; small, not a good layer, rather low production
White Rock	North America	dual-purpose with good meat quality

African Organic Agriculture Training Manual Animal Species M10: Poultry Husbandry U3 72

6. Breeds and breeding

6.1 Breeds

Domesticated chickens originate from the red jungle-fowl (formerly known as the Bankiva or Bankiva fowl) and some other wild species in Southeast Asia. From there, domesticated animals were brought to the entire world by tradesmen and sailors. Over time, domestication and breeding resulted in many distinct breeds that vary in colour, size and other traits such as performance.

6.1.1 Hybrids

In high-producing intensive systems, but also on many specialised organic farms, hybrid chickens are commonly used. Most hybrids are specialised either in egg production or for meat production.

While hybrid layer hens lay up to 330 eggs per year, their roosters are not good for meat production, as they gain weight very slowly and thus need much feed and time to reach slaughter weight. So far, the common practice was (or still is) to kill the male chicks of hybrid laying breeds right after hatch. In some countries, they are sold to small-scale producers at a low cost.

On the other side, broiler hybrids have a very high weight gain, but aren't suitable for egg production. They grow so fast that they have difficulty walking and surviving until reproduction. In the last years, dual-purpose hybrids have been bred by some breeding companies. The hens of these hybrid chickens lay slightly less and sometimes smaller eggs, while the roosters grow a bit slower, but are still very good for meat production.

All hybrids have in common that their feed ration needs to be properly formulated to fulfil their special needs, and management needs to be very good so that they reach their production potential.

Most hybrids are bred in cages (not allowed in organic farming). Their husbandry in environments of organic farms and in regions with climates other than temperate conditions may be challenging. Nevertheless, some breeding companies offer parent stocks to produce dual-purpose chickens for a variety of climatic conditions as found on the African continent.

Hybrid chickens are bred from four different highly selected grandparent lines. They have been selected for maximum performance. A few large companies developed the hybrids and own the grandparent stock. If a farmer breeds

with hybrids, the offspring will not have the same performance as the parents. Therefore, new hybrid chicks have to be bought for each batch.

6.1.2 Pure breeds

In traditional and extensive production, the use of pure and indigenous breeds is common. Many of them are dual purpose breeds, which means that the hens are used for egg production and the roosters, as well as old hens, for meat production. Indigenous breeds are often well-adapted to local conditions and are therefore more robust. In some countries, they are also highly preferred by consumers for their taste. Despite these advantages, many larger producers do not use pure breeds because they do not perform at the same level as a well-bred crossbreeds or hybrids.

In pure breeds, hens and roosters are of the same breed. Therefore, they can be used for breeding on the farm. The offspring will have similar traits as the parents. Performance of the breeds can be increased by selecting the hens and roosters with the best performance on a farm for reproduction. Over time, this will allow the breeding of chickens that are adapted to the specific circumstances and needs of a farm.

Pure (indigenous) breeds are suitable if farmers are looking for robust animals. However, these breeds will never lay as many eggs as a layer hybrid or grow as fast as a broiler hybrid. One reason for this is that the energy and nutrients the chickens have available can be invested either in maximising egg production, or in maximising muscle growth, or a little of both. Maximum performance in egg production and muscle growth at the same time is biologically impossible. Another reason for this is that hybrids use the so-called heterosis effect: when crossbreeding two genetically different strains, the offspring can show better performance than the parent lines.

6.1.3 Cross-breeding

A good option to increase performance in chickens is the use of cross-breeds. For breeding cross-breeds, two different pure breeds are taken. The advantages compared to hybrids are that the pure breeds are not owned by companies, and that one can select breeds as parent stock that suit specific needs and are well-adapted to the local conditions. Similar to hybrids, offspring of cross-breeds often shows better performance than the parent breeds.

Sharing of knowledge on chicken breeds

Encourage sharing of experiences and discussion in groups on chicken breeds by asking the following questions:

- What are your experiences with chicken breeds/cross-breeds/hybrids? What are their advantages and disadvantages?
- Are these chickens suitable for the climatic and husbandry conditions on your farm?
- Do you know any hatchery, breeder, farmer or other person who keeps this breed in your region? Do you know, how successful they are with respect to animal health, viability and production?
- Which additional information do you need to choose animals for breeding? Where can you get this information? What are trustworthy sources?

Important traits for organic chickens are, for example, a good tolerance to changing feed quality and good suitability for the outdoor run. Furthermore, the breeds should perform well under the prevailing climatic conditions.

For cross-breeding pure breeds, both pure breed lines must be available for breeding of each batch. Generally, a flock of the mother line is reared, whereas the father line is brought in with changing roosters from other breeders.

When cross-breeding, one must know that good performance of the offspring is not guaranteed. For good results, parent stocks need to be chosen with consideration, and performance of the offspring must be documented in order to find suitable combinations for specific needs. Furthermore, breeding efforts are also required for the parent breeds, if one wants to further increase the performance of a preferred cross-breed.

Successful selection requires many chickens and generations. Therefore, it is advisable to join forces with other chicken farmers or – if available – to buy chicks from professional breeders in the region.

Another option for farmers is to start with a well-adapted and well-performing indigenous breed and cross-breed it with changing well-performing dual-purpose breeds, meaning by using roosters from different breeds every one or two years. This increases the chance of better offspring performance (increased heterosis). However, there is no guarantee that performance always benefits from such experimental breedings. It can also be challenging to regularly find new suitable breeds locally for cross-breeding.

6.1.4 Dual-purpose breeds

With the increasing importance of high-performing hybrids for egg and meat production worldwide, attention to the performance of traditional breeds has decreased. Most traditional breeds have been kept for preservation of the breed, and selection focused more on appearance than performance. Nevertheless, there are still many traditional dual-purpose breeds with promising features for breeding, and breeders who have been selecting these breeds for good production performance.

6.1.5 Considerations

When choosing a breed, a cross-breed or a hybrid, the suitability of the breed for the environment it is expected to live in needs to be considered. Many hybrids are selected for good performance in cages and with trimmed beaks. Their use in

alternative systems such as semi-intensive organic production can be challenging. Traditional breeds that thrive in Nordic climates may do less well in warmer conditions, and those coping well in dry areas might have problems in more humid environments.

6.2 Breeding

For breeding, whether it is for pure breeds or cross-breeds, a number of criteria need to be considered, observed and monitored, and the individuals for breeding must be selected carefully to further improve the breed towards the expected characteristics and performances. For the selection of hens, individuals with a good body weight and a good laying performance must be selected. Selection criteria for the rooster can be weight gain, feed conversion, body weight, vigilance and behaviour towards humans and hens. All breeding chickens must be fit and healthy. For indicators for healthy chicken see chapter 5.3.1.

Of course, eggs for breeding need to be from groups of chicken with roosters for insemination of the eggs. The date of lay must be noted on the breeding eggs with a pencil to be able to estimate the hatching date. Additionally, information about the parent stock can be written on the egg, if one wants to know from which hen an egg is. Fertile eggs can be incubated either by broody hens or in an incubator. The chicks hatch in general after about 3 weeks. Hatching rates can differ largely depending on the breed, fertility, temperature, humidity and duration between lay and incubation. For eggs shipped from somewhere else, the hatching rate can be as low as 50 %. When breeding is done on a farm, one should aim for a hatching rate of at least 80 %. If the hatching rate is below 80 %, the number of roosters may be insufficient or the conditions during incubation are not ideal.

6.2.1 Brooding with hens

For many generations, the hens of many breeds have been selected for high egg laying performance. Their broodiness is reduced, as broody hens naturally stop laying eggs when the clutch is complete. If one wants the fertilised eggs to be incubated by hens, he/she has to find hens that become broody. Some breeds are known to be good brooders and chick mothers. One very well-known breed is the silky chicken. Silky chickens are often used solely for this purpose, as their laying performance is rather low and the eggs are quite small. Of the African breeds, the

South-African Potchefstroom Koekoek is said to be sufficiently broody, and is at the same time used for egg and meat production. But one can also find broody hens in other dual-purpose breeds. One can identify them easily by looking for the following signs.

A broody hen …
- Leaves the nest only shortly to feed and drink,
- Stops roosting on perches during the night to stay in the nest,
- Stops laying eggs,
- Protects the nest by squawking, growling, puffing up her feathers or pecking,
- Pulls out her chest feathers.

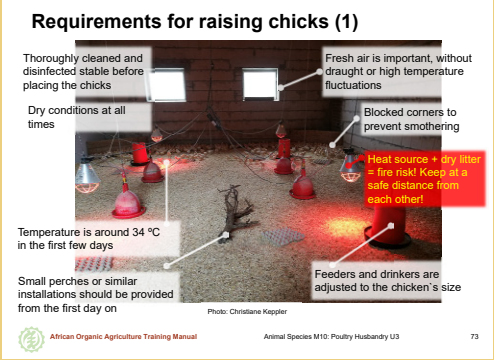
Hens don't have to show all signs when they become broody, but these signs give a good hint. The most important one is that the hen stays in the nest during the night. Hens rarely become broody in winter, when days are very short. If one wants to encourage hens to become broody, spring or beginning of summer is the best time to do so. The farmer should provide the hens with sufficient warm, dark and secluded nests with food and water nearby. Putting several dummy eggs into the nest will further encourage brooding. Dummy eggs can be made of wood, clay, or even plastic eggs or smooth stones can be used.

When the hens are visibly broody, the dummy eggs can be replaced by fertilised eggs during the night or while the hen is feeding.

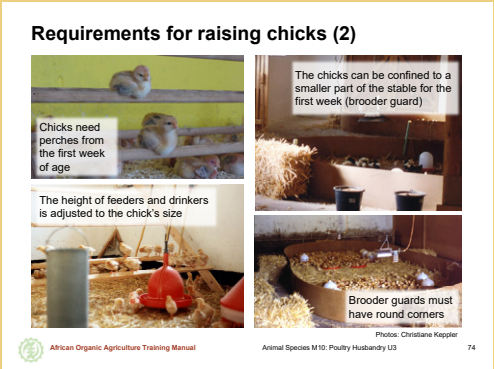
Feed and water should be served in close proximity to the brooding nests, so hens don't starve while brooding. It is advisable to separate the broody hens from the other chickens. This will ensure that they are not disturbed, and it prevents other hens from adding eggs during the brooding period. If too many eggs are added by other hens, it may become difficult for the brooding hen to keep the eggs warm with the result that the eggs do not hatch. Or some eggs may be ready for hatching while others are not, and the hen would then leave the nest with the chicks and abandon the other eggs with the unhatched chicks. If the brooding hens cannot be separated from the remaining chickens, the fertilised eggs can be marked with a pencil and additional eggs can be removed daily.

Outside the brooding period, the broody hens are usually kept separately from the layers, as the broody hens stop laying eggs as soon as their clutch is complete. Furthermore, they are more reluctant to feed, drink and dust bathe. Last but not least, broody hens can trigger other hens to become broody as well.

RAISING CHICKS (1)



RAISING CHICKS (2)



One broody hen can brood 10 to 12 or 15 eggs per batch, depending on her size and the eggs' size. For a batch of 50 new layers for egg production and 50 roosters for meat production, about 12 broody hens are needed who raise about 100 chicks or more, depending on the hatching rate and chick survival.

6.2.2 Raising chicks from artificial incubation

Artificial incubation is common in middle and large-scale brooding. Usually, brooding of large numbers of chicks is not done on the farms producing the eggs and the meat, but on specialised brooding farms. These farms have parent stock to produce the fertilised eggs, and have the equipment to incubate the eggs until hatching. Artificial brooding requires incubators that provide optimal temperature and humidity to ensure high hatching rates. The brooding farms deliver day old chicks either directly to farms for meat production or to farms specialised in raising chicks for a few weeks, who then sell the young hens and roosters to the production farms.

Buying preraised chickens can be a good option if they are available in the region, as the husbandry of the chicks in the first few weeks is challenging. In this phase, chicks need a lot of attention, professional care and good feed. Additionally, during this time vaccinations must be carried out (see chapter 5.4). When buying young stock, farmers must make sure that the chicks have received the necessary vaccinations, look healthy, and are well developed. The body weight should correspond to the expected body weight of the specific chicken strain at that age.

If farmers want to raise their own chicks or buy day-old chicks without having mothering hens, they must make sure to fulfil the main cornerstones of successful chick rearing as described below. Additional and more detailed information may be necessary to ensure proper rearing with minimal losses and well-developed animals.

Cornerstones of successful chick rearing:

› **Hygiene:** The stable must be thoroughly cleaned and disinfected before new chicks arrive. If the stable has been used for poultry before, an empty period of at least two weeks is necessary to reduce the risk of transmission of pathogens. The litter must be dry and clean at all times. Wet litter has a very negative impact on chick health and must be removed and replaced by fresh dry litter immediately.

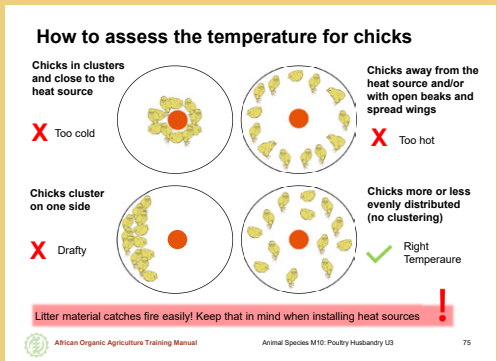
Exercise on production systems, feeding and breeds

Prepare four different examples of farms. These farms can be imaginary or real farms and are described to the participants in detail: farm size, crops cultivated on the farm, location, climate and weather conditions, available manpower, level of mechanisation, soil type, animals on the farm.
Ask the participants to discuss the following questions in groups:

› Which poultry production system would you recommend to use?
› How can the chickens be fed?
› Which breeds would best go to the farm?

Then, every group should present their ideas and thoughts. After every presentation, give some additional clarification or recommendations, if necessary

ASSESSING STABLE TEMPERATURE

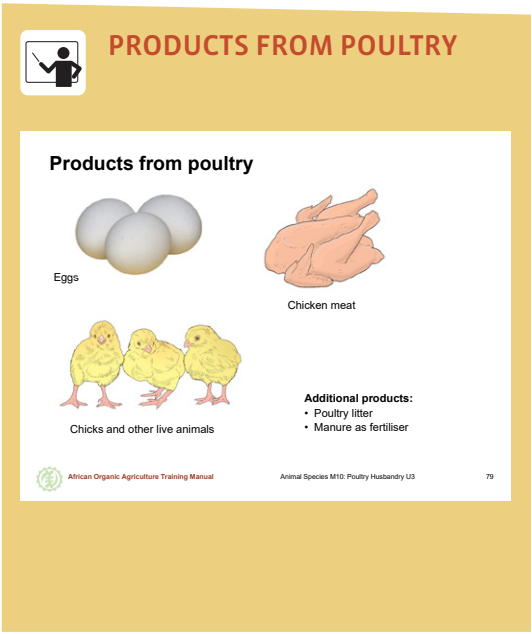


- **Care:** The chicks must be checked several times a day. All chicks must look healthy and have access feed and water. All chicks must have access to all resources at all times. The distribution of the chicks with regard to the heat source must be observed, and the filling of the crop must be checked. In case of inhomogeneous growth, even the smallest chick must be able to still reach the feeders and drinkers.
- **Ventilation:** The stable must receive fresh air without draught and without too much temperature fluctuation.
- **Temperature:** The temperature should be around 34 °C in the first few days, and then decrease slowly. The best way to provide the right temperature is to let the chicks choose the place with the appropriate temperature, and to observe their behaviour. The chicks need to have the possibility to move away from the heat source if it is too warm, but it should never be too far so that they cannot find their way back. Chicks need to find water and feed in close proximity of the heat source to stay warm at all times.

OCCUPATION TO CHICKS AND CHICKENS (1)

OCCUPATION TO CHICKS AND CHICKENS (1)

BUILDING AN INDOOR DUST BATH



- **Water:** Clean and sufficient water is extremely important. Chicks need approximately 2 to 6 times the amount of water compared to feed. The higher the temperature, the higher their need of water. The water must be so clean that it could be served to humans without hesitation.
- **Feeding:** See chapter 4
- **Vaccination:** See chapter 5.4
- **Setup:** The stable must be dry, even in the rainy season (see chapter 3 for more details). Feeders and drinkers must be adjusted to chick size. The space for day old chicks should be round or corners need to be rounded, e. g. with cardboard, to prevent piling and smothering. Small perches should be offered from the beginning to train chicks to use them.
- **Documentation:** Chicks can be weighed on a regular basis to compare the weight to breeder recommendations for the respective strain at the age. Weights within a flock should be as homogenous as possible.
- **Preparation:** The stable must be prepared in advance with enough time for cleaning, repairs and disinfection. At least one day before chicks are delivered, all resources should be installed and filled and the stable needs to be heated.

7. Products

7.1 Eggs

Eggs consist of the egg white and egg yolk; both contain high-quality protein. Egg yolks have a high fat content. Furthermore, eggs contain high levels of vitamin A, D, and some vitamin B. Therefore, eggs can significantly contribute to a healthy human diet. Organically produced eggs have a lower risk of antibiotic contamination, are produced in an animal-friendly way and are free from artificial feed ingredients, such as synthetic pigments to influence egg yolk colour.

Eggs can be sold directly to consumers, on a local market, to a trader or middlemen, or through formal cooperatives.

Producing a good quality eggs

Animal husbandry, breeding, feeding and diseases all have an impact on egg quality. A balanced and performance-adapted diet with sufficient nutrients com-

bined with strong and healthy hens enables the birds to produce eggs with a strong eggshell and a yellow, well-formed yolk.

Diseases, nutrient deficiencies, and diet can all affect the look and quality of eggs. For example, some diseases such as Newcastle Disease can lead to misshapen eggs (see chapter 5: Health and diseases). A calcium carbonate deficiency can result in eggshells that are too thin or misshapen (see chapter 4: Feeding), and a high proportion of yellow maize or grass in the diet will result in a deep yellow yolk.

Collection, storage and transport of eggs

Eggs must be collected, cleaned, handled and stored correctly in order to maintain the highest possible quality. Improperly handled and stored eggs will result in premature spoilage and may impair human health.

Collection, marking, and cleaning: Eggs should be collected once or twice a day. If eggs are marked during or after collection they should only be marked with a pencil or ink made specifically for this purpose. Ingredients from ink pens or permanent markers can penetrate the egg shell, and these toxic substances would then be consumed together with the egg.

Very dirty eggs take more time to process, so measures may be considered to keep eggs clean. To get cleaner eggs, the nests can be set up in a way that the chickens walk over something like a wire mesh that will clean their feet before they enter the nests. Furthermore, the nests must be kept clean and full of fresh litter, and the eggs must be collected regularly (see chapter 3: Housing for more details on nest design).

After collection, and possibly marking, the eggs should be cleaned and sorted, paying attention to the following aspects:

- No water should be used to clean the eggs, as water allows microorganisms to penetrate the shell and multiply inside.
- Only the dirty patches of the egg should be cleaned with fine sandpaper, a dry sponge or a rough cloth.
- Damaged eggs, and eggs that are contaminated with egg white or yolk are sorted out.
- Also eggs with a weak shell should be sorted out, as they are more likely to be damaged during transport.

Excursion to a poultry producer

Visit a poultry producer (preferably organic) and discuss the following aspects together with the farmer:

- Which poultry products does the farm sell?
- Which products are available but not sold to others? Why are they not sold? Can they create value for the farm?
- Who buys eggs from this farm?
- Why do the customers buy from this farm and not from another one?
- How are the eggs stored? What could be improved to ensure a high-quality product?
- How are the eggs transported? What could be improved to ensure a high-quality product?
- What are the limiting factors of scaling egg production on this farm?

The same questions can be discussed regarding poultry meat and live animals.

Storage: The clean eggs should be stored in trays with the tip down in a dark and cool place until transport or sale. A continuous temperature between 10 and 15 °C during all stages of egg processing (cleaning, storage, transport and sale) is ideal. A refrigerator is generally around 5 °C, and is therefore too cold and not recommended. Subsequent storing of the eggs at a higher temperature would then result in a loss of quality.

Eggs lose water through evaporation during storage, so their storage time is limited. Eggs can also absorb strong flavours from the environment around them. Therefore, eggs should not be stored near strong-smelling materials such as disinfectants, soaps, fuels or dyes.

Transport and sale: Eggs should be transported carefully and shaking should be avoided as much as possible. Only clean and fresh eggs should be sold.

7.2 Poultry meat

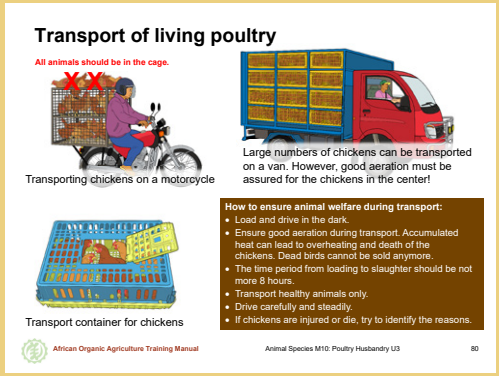
Poultry meat can be produced with broiler chickens. In this case, both, male and female chicks are raised for meat. With dual purpose chickens, male chickens are raised for meat production. Hens that have stopped laying can also be slaughtered. The same applies for single purpose laying hens. Organic chicken meat is considered to be tastier and have stronger flavour than commercial broiler meat. Organic chicken feed does not contain antibiotics, anti-mould compounds, enzymes or synthetic chemicals.

The price for poultry meat depends on the available supply, the age and sex of the bird and their size or weight. The chickens can be slaughtered in a processing plant or at the farm, but should only be slaughtered by a trained butcher. Slaughter must be done as humanely as possible, avoiding any unnecessary suffering.

7.3 Fertilised eggs, chicks and young hens

Breeders can sell fertilised eggs, day old chicks, preraised chicks or young hens to other farmers. This requires a good knowledge of chicken husbandry and the local market for chickens (e. g. that only chickens are bred that are in demand from other organic farmers, like good-performing dual-purpose breeds or crossbreeds (see chapter 6.1)).

TRANSPORT OF LIVING BIRDS



EXPECTED COSTS (1)

Checklist on expected costs (1)

Initial investments
• **Poultry house:** walls, floor, roof, electricity, lighting, perches, manure management, nest boxes, feeders, drinkers, bedding
• **Poultry run:** fencing, bedding, structures like covered sand baths
• **Pasture system:** fencing, tree and bush planting, additional shelters
• **Storage area:** cool storage for eggs, egg trays, cold storage for meat, etc.
• **Market sales equipment:** egg trays, crates, etc.
• **Transport equipment for live animals:** crates, etc.
• **Egg incubation equipment** (if desired)
• **Chick rearing equipment:** enclosure, heating system, lights, small feeders and drinkers
• **Biosecurity:** hand washing stations and clean boots in each house, perimeter fence around chicken area, burn pit, compost pit, quarantine house for new birds, storage and sales area outside the chicken area
• **Cleaning supplies:** broom, scraper, garden sprayer, organic approved chemicals and substances
• **First aid supplies:** disinfectant, place to separate injured birds

African Organic Agriculture Training Manual Animal Species M10: Poultry Husbandry U3 81

EXPECTED COSTS (2)

Checklist on expected costs (2)

Ongoing operational costs
• **Animals:** eggs, chicks, pullets, adult birds, etc.
• **Feed:** base feed, vitamins, minerals; own crops that are used for feed need to be taken into account in the budget, too
• **Water**
• **Bedding and litter**
• **Veterinary care:** vaccines, visit and medication costs
• **Transport**
• **Slaughter and processing**
• **Marketing**
• **Labour**
• **Technical advice:** extension services, organic groups
• **Building and equipment maintenance**
• **Loan repayment and interest**
• **Other unforeseen costs:** always budget some room for these

African Organic Agriculture Training Manual Animal Species M10: Poultry Husbandry U3 82

The first weeks in a hen's life have a large impact on its later performance. Therefore, proper raising of young hens for sale plays an important role in poultry production. Professional breeding and raising of young hens requires experience and proper information (see also chapter 6.2).

7.4 Live chickens

Poultry meat is commonly purchased live and slaughtered immediately before consumption where no proper refrigeration is available. Live poultry are also used for ceremonies, sacrifices or gifts. The price depends on available supply, the age, sex and breed of the bird and their size and weight. These factors need to be taken into consideration when deciding when to sell animals.

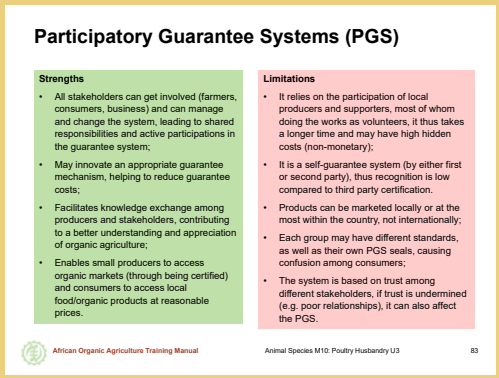
Transport of living birds

Transport of living chickens may be necessary if they are sold alive or brought to a slaughter plant. Pre-slaughter stress is unkind to the animals and reduces meat quality, and should therefore be minimised. Excessive heat, rough handling, and long periods in a crate or without water should be avoided.

To ensure animal welfare during transport, farmers should comply with the following requirements:

- Feed withdrawal before slaughter leads to a clean digestive system, which facilitates the slaughtering process. However, feed should not be withdrawn for more than 12 hours (including the duration of transportation). Water must be available until loading.
- The animals should be loaded when it is dark.
- Loading must be assisted and observed. If necessary, instructions for proper chicken handling must be given (see chapter 2.3).
- Like loading, transport is desirably done at night. In the dark, the animals are sleepy and less agitated, and temperature is lower than during the day.
- If transport cannot be done at night, the birds should be transported during the cooler part of the day. Ideal temperature for transport is between 10 and 24 °C.
- During transport, good ventilation is required. Without good ventilation, heat accumulates which can lead to overheating of the birds and high losses (dead birds cannot be sold anymore).

CERTIFICATION



- The duration from loading to slaughter should be as short as possible and ideally not exceed 8 hours.
- The birds should be kept in containers designed for that purpose: The containers should have an anti-slip floor, be undamaged, and well-fixed in the transporter.
- Every chicken in the container must have at least 200 cm^2 of space per kg of weight available. The birds should be able to lie down.
- The animals and containers should be handled gently to prevent injuries to the animals.
- Only healthy animals should be transported. Sick or injured animals should be killed on the farm, or only be transported to the veterinarian.
- The driver should drive carefully and steadily, and avoid rapid braking.
- If chickens arrive injured or dead, the reasons need to be identified to avoid this damage in the future.

8. Economics and organic certification

8.1 Starting a poultry business

Before starting an organic poultry business, it is important to know the market, the investment costs, running costs, and expected revenue for all products. So, farmers must calculate if the business is economically feasible before deciding to produce poultry organically, to decide which products to produce, and what to start with. Risk assessment by analysing potential events that may negatively impact poultry production should be part of the economic feasibility check.

Determining costs and revenues

The expected costs including initial investments and ongoing operational costs can be estimated based on the lists in the slides.

The expected revenues include animal products like eggs for consumption or fertilised eggs, meat, live birds, and by-products. Although own products harvested by producers from their own farms for feed and manure from the farm for fertilising the crops are not strictly revenues, they reduce the expenses and, in the case of manures, increase yields. Therefore, they should be considered in the budget.

Exercise on business planning and managing risks

Using the checklist as a general guide, ask the farmers to work in small groups to make a rough budget with expenses and expected revenues together.

Invite then the groups to present their estimations. For the discussion, use the following questions:

- What costs are unclear or unknown?
- Are there any additional costs not listed?
- What kind of marketing plan and costs have producers experienced?
- What are some of the risks and challenges in business planning that producers have experienced, and how did they overcome them?

8.2 Organic certification and marketing

Small-scale poultry production mostly aims at improving household nutrient consumption along with income. With growing awareness of animal welfare and sustainable agriculture in African societies, there is growing interest in organic certified eggs and chicken meat on national markets. However, on an international level, there may be demand for these products only in regional markets.

For marketing and labelling poultry and other agricultural products as organic, there must be a verifiable system to confirm that these products have been produced according to acceptable organic practices.

8.2.1 Organic certification

Certification is the process by which an organic inspection and certification body gives a written and reliably confirmed assurance that the products have been produced in accordance with specific organic standards. Certification is crucial to building confidence among producers, processors, distributors and consumers.

In Africa, most organic farms are certified as groups, not as individual farms. Group certification is done either through an Internal Control System (ICS) or a Participatory Guarantee System (PGS).

In Africa, animal products are commonly targeted for the local market in the producing countries whereby production is based on locally accepted standards, and commonly sold under participatory guarantee systems (PGS) as compared to the more expensive third party certification with ICS which normally applies to international exports.

Third party certification

In Europe, the legal basis of organic agriculture is the new Regulation (EU) 2018/848. However, organic imports into the EU are still certified under the previous Council Regulation (EC) 834/2007 until the end of 2024. Organic agriculture, both in the US and for imported products, is regulated in the National Organic Program Regulation (NOP). These regulations define the rules for organic production, processing and labelling of agricultural products as "organic" in these countries. For the export of organic products outside of Africa, farmers would have to comply with the legal standards of the country of import. In some cases, additional certification against private organic standards is necessary. The standards

Discussion on organic certification

Discuss in small groups the following questions:

- What questions do you have about organic certification?
- What are some of the costs and benefits of certification?
- What are local and national organisations that can advise you if you want to convert to organic poultry production?

from private label organisations are stricter than national regulations. Whereas the EU regulation permits farms to operate both an organic and a non-organic production unit under special restrictions, most private organic label organisations require that the entire farm must be managed organically (for more information see the manual on organic certification at www.organic-africa.net).

Generally, for small farms, only conversion of the entire farm is recommended, as the farm unit would become too small to enable establishment of a diverse production system, allow proper crop rotation and introduction of livestock. Parallel production, i.e. the production of the same livestock species under organic and non-organic management, is not allowed even under the EU Regulation.

The certification process starts with signing a contract with an organic certification body operating in the country. The conversion begins once the farmer renounces the use of synthetic pesticides, fertilisers, GMO and chemically treated seeds, and starts to apply all organic crop and livestock production rules including the use of organic animal feed, good husbandry practices, etc.

For plant production and pastures, the conversion period to organic is 2 years before sowing for annual crops and 3 years before harvest for perennial crops. Land that has not been treated with forbidden substances for at least 3 years can be certified with a retroactive recognition of the conversion period. For organic animal production, feed production and pasture on the farm must be converted to organic, too. So, for most farms the conversion period of the land (crops and pasture) determines when the farm becomes organic. The specific length of the conversion period otherwise depends on the animal species and whether the animals are kept for egg, meat or milk production (6 weeks up to 12 months).

After the first 12 months of conversion, products can be marketed as 'organic in conversion'. Once the conversion period is finished, the products can be certified and sold as organic. A stepwise reduction of agrochemical use is not considered part of the conversion period.

The national organic movement or organic certification bodies operating in the country can provide further guidance and support for organic certification. Farmers should first consult the national organic movement and then sign a certification contract with an accredited organic certification body operating within the country. Producers should work with a certification organisation that has the necessary accreditations for the required standard and target markets.

Organic certification commonly happens through inspection and certification of an individual farm by an accredited certification body. But farmers can

also be certified as a group. Annual Internal inspection for each farm member in the group is then carried out by an Internal Control System (ICS) and the ICS' work is cross-checked by the external certification body during the annual inspection of the group.

Having completed the formal conversion period and received organic certification does not mean that the development of the farm is finished. It usually takes several years to establish a well-balanced farm ecosystem and restore natural soil fertility in the fields in the sense of organic farming.

East African organic products standard

The East African organic products standard (EAOPS) has been written for organic production in East Africa and has been adapted to conditions in East Africa. The East African organic products standard can be used for self-assessment by producers, declarations of conformity in the marketplace, certification by certification bodies in the region, or other kinds of verification. If the standard is used for the purposes of third-party certification, inspection and certification should be carried out in accordance to international norms, such as ISO Guide 65 or the IFOAM Accreditation Criteria. If adherence to the standard is verified through other mechanisms, those mechanisms shall adhere to the principles of competency, integrity and transparency.

Products from the same type of animal and the same type of production which are both organic and non-organic (conventional or in-conversion) on the same farm shall not be sold as organic unless the production is done in a way that allows for the clear and continuous separation of the organic and non-organic productions. The conversion period for poultry (meat and eggs) in the EAOPS is 45 days.

Participatory guarantee systems

Alternatively to classical third-party certification system, where an independent body is responsible for certification, Participatory Guarantee Systems (PGS) can be managed by producer groups themselves. PGS enable small producers to access and secure markets through a participative and collective certification mechanism. According to IFOAM, PGS are locally focused quality assurance systems based on the active participation of farmers, consumers, rural advisors, and local authorities. They all join to make decisions, to visit farms, to support each other and to check that farmers are producing according to an Organic Standard.

PGS are built on a foundation of trust, social networks and knowledge exchange. PGS are very suitable for local or regional marketing, but will not be accepted by key organic import markets like the EU or the US. For more information see at www.ifoam.bio › Standards & Certification › Participatory Guarantee Systems.

8.2.2 Marketing

Like all other organic products, organic certification for poultry is worthwhile only if the eggs and/or the meat can be marketed with an organic price premium over the regular price. The premium must at least cover the certification costs and the major costs caused by organic management.

Ideally, most or all the products from the certified farms are marketed with an organic premium. In the case of exporting a product, the farmers need to work together in a group to produce enough volume and to ensure the quality and quantity requirements of the target market.

One of the key motivations driving farmers to convert to organic farming is the ability to access niche markets for their produce or products. Even under subsistence farming, with adequate quantities of crop and animal production, farmers should consider exploring market opportunities to sell the excess production to improve their incomes to meet other household needs. Before deciding on the market to target, if not already provided by the agents promoting organic farming, it is important to understand the requirements of that market in terms of the following aspects:

- The type of customers and their product requirements,
- The key actors, especially existing and potential competitors,
- Information about delivery channels and cost of delivery,
- Information about price offers and any premiums,
- Storage and packaging requirements,
- The required quantities, timeliness and consistence in delivery,
- Quality requirements,
- Whether organic certification is required and for which standards,
- Any value addition required to the products.

For more information on marketing of organic products, for example…

- where to find relevant information about market opportunities, prices and quality requirements,
- how the organic market chain is organised,
- how to identify and take advantage of organic market opportunities,
- how to identify market expectations in terms of quality, standards and know-how to cope with these standards,
- how to assess the market potential of organic products,
- how to develop a marketing concept, define a marketing strategy and apply marketing techniques,
- how to promote organic market development beyond individual businesses,
- how to determine usefulness of organic certification, and how to get access to it.

see the training materials related to marketing at www.organic-africa.net, including a trainer's module, a booklet and a video.

9. Resources and further readings

- Small-scale chicken production: https://www.agromisa.org/wp-content/uploads/Agrodok-04-Small-scale-poultry-production-in-the-tropics.pdf
- Hatching and brooding in small-scale poultry keeping: https://www.agromisa.org/wp-content/uploads/Agrodok-34-Improving-hatching-and-brooding-in-small-scale-poultry-keeping.pdf
- Small-scale poultry production: https://infonet-biovision.org/Publications/Keeping-village-poultry-technical-manual-small-scale-poultry-production
- Chicken production: https://infonet-biovision.org/AnimalHealth/Chicken
- Farmer field schools for family poultry producers – A practical manual for facilitators: Farmer field schools for family poultry producers (fao.org)
- Improving village chicken production – A manual for field workers and trainers https://www.aciar.gov.au/publication/books-and-manuals/improving-village-chicken-production-manual-field-workers-and-trainers

Slaughtering

- FAO factsheet about handling and restraining poultry: https://ec.europa.eu/food/system/files/2021-08/aw_prac_slaughter_factsheet-2018_handle_poultry_en.pdf
- FAO factsheet about stunning and killing poultry: https://ec.europa.eu/food/system/files/2018-06/aw_prac_slaughter_factsheet-2018_farm_poultry_en.pdf
- The East African Organic Products Standard: https://law.resource.org/pub/eac/ibr/eas.456.2007.html or https://kilimohai.org/fileadmin/02_documents/Standards/East_African_Organic_products_standard.pdf
- IFOAM Standard: https://www.ifoam.bio/our-work/how/standards-certification

General information on livestock production in Africa

- https://www.fao.org/3/i7222en/I7222EN.pdf
- https://www.fao.org/3/cb3700en/cb3700en.pdf