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With many new small-scale poultry farmers looming on the horizon, as well as many existing small-scale farmers already in production, the need occurred to provide these farmers with a manual on housing facilities and equipment needed for small-scale poultry production.

These production facilities include both broilers for production of meat and layers for production of eggs. Issues like general planning of the production system, brooder chick production and building materials and methods are also discussed.

The aim of this manual and all data within is to provide the reader with information on basic low-cost construction materials and methods, as well as equipment needed for poultry houses.

We trust that this manual would help small-scale poultry farmers to farm profitable and help them expand their enterprise.
CHAPTER 2
GENERAL PLANNING OF POULTRY PRODUCTION SYSTEMS

2.1 Market and resource evaluation

Before you can start producing chickens, either as broilers or layers, there are a few factors that must be taken into consideration. The most important are a suitable and reliable market, resources and financial aspects.

2.1.1 Market

Before you start your production system, make sure that you have a market for your poultry produce.

The size of the market will determine the maximum number of broilers or layers that the farmer could farm with such that all his produce will be sold.

The price of the broilers or eggs, at which the farmer can sell on the market, will determine the minimum number of chicks that must be farmed with in order to make a profit.

The distance to the market will affect how often the farmer can get his produce to the market and the cost of getting his or her produce there.

2.1.2 Resources

The following resources are necessary for a successful poultry production unit:

- The size and situation of the land available for poultry production. Is it large enough for the production of the minimum number of chicks necessary for profit making? Is it in a suitable location to provide a favorable climate in which the chicks can be reared?
- The amount and availability of water. Is there enough water for the chickens and is it reliable and easily accessible?
- The cost and availability of feed. Where can feed be bought or grown and at what cost?
- Are there materials available for building the poultry house and how many materials must be bought?
- The cost and availability of medicines for diseases.

2.1.3 Financial aspects

For a profitable production unit, the following questions have to be answered:

- Is there money available to build the poultry house and to start the production cycle?
- Is it economical when taking into consideration the costs and the profits made?

2.2 The poultry production cycle

The production cycle starts with the purchasing of day-old hybrid chicks from a well known reliable supplier. These chicks are reared in brooders until they are old enough to be separated into either pullets for egg production or broilers for meat production. These are then raised differently according to certain conditions, until ready for market. Fig. 2.1 illustrates the production cycle of poultry.
2.3 Economic evaluation

Before starting a poultry business, it is recommended that the farmer make an estimate of the annual budget of expenditure and income. This is to find out if there will be sufficient profit as compensation for the farmer's own labour input when all expenses are paid.

2.3.1 Budget for broilers

Broilers are bought as one-day-old chicks and reared for a period of six to nine weeks, thus it is reasonable to have five to seven batches of broilers in a year. Compiling an estimated budget for producing broilers, the following factors have to be taken into consideration:

Expenditure

- Building cost

This includes purchase of building material, site preparation, provision of water to the broiler house and storing thereof, as well as watering, feeding and heating equipment.

If it is possible to obtain a loan from a financial institution such as a bank, the amount payable per annum can be calculated with the following parameters:
For example, say the capital cost for building material and all equipment for a certain size of broiler house is R15 000 (A). If a loan is approved at an interest rate of 19% (r) per annum for a period of 5 years (p), the amount payable each annum (T) for 5 years, can be calculated as follows:

\[
T = \frac{A \times [(r \times (1 + r)^p)]}{[(1 + r)^p - 1]}
\]

\[
= \frac{15 \,000 \times [(0,19 \times (1 + 0,19)^5)]}{[(1 + 0,19)^5 - 1]}
\]

\[
= \text{R4 905 per annum}
\]

\[
= \text{R409 per month}
\]

Direct costs

Direct costs per batch or cycle include:

- Price for purchase of day-old chickens
- Feed for six to nine weeks
- Medication
- Cleaning and disinfecting products
- Bedding material (if not available from the farm)
- Heater fuels (gas, electricity or paraffin)

Add all these totals and multiply it with the number of batches per annum. This will give the total direct cost per annum.

Indirect costs

Indirect costs per batch or cycle include:

- Transport costs for feed and chickens
- Maintenance of the building structure
- Slaughtering costs (if necessary)

Add all these totals and multiply it with the number of batches per annum. This will give the total indirect cost per annum.
Income

Income from broilers is meat, about 1,5 kg dressed weight, or 2,0 kg live weight per broiler. Multiply the mass of one broiler by the income per broiler (R/kg) and multiply that by the total number of broilers in the unit. Remember to reduce the total number of birds with 5 to 10% for mortalities.

For an extra income, manure may be sold or utilised as compost.

Remember that the figures in the budget are relevant but only estimations. After the first batch, get new figures from actual records and do a recalculation of the budget.

Example

An economic evaluation for a 500 deep litter broiler unit is shown below. Note that all numbers and amounts are estimations and may differ for different farmers and regions.

The total expenditures for the start of the unit, may be calculated as follows:

<table>
<thead>
<tr>
<th>Expenditure</th>
<th>Amount (Rand)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building materials and construction</td>
<td>R7 260</td>
</tr>
<tr>
<td>Equipment for water, feed and heating</td>
<td>R3 230</td>
</tr>
<tr>
<td>Purchase of day-old chickens (@ R2.20 each)</td>
<td>R1 100</td>
</tr>
<tr>
<td>Purchase of feed:</td>
<td></td>
</tr>
<tr>
<td>Starter mash (15 bags of 50 kg)</td>
<td>R1 505</td>
</tr>
<tr>
<td>Grower mash (15 bags of 50 kg)</td>
<td>R1 390</td>
</tr>
<tr>
<td>Finisher mash (15 bags of 50 kg)</td>
<td>R1 390</td>
</tr>
<tr>
<td>Gas for heating (1 gas bottle + deposit)</td>
<td>R290</td>
</tr>
<tr>
<td>Cost of medicine (R0.50/chicken)</td>
<td>R2 50</td>
</tr>
<tr>
<td><strong>Total cost</strong></td>
<td><strong>R16 415</strong></td>
</tr>
</tbody>
</table>

If a loan is approved at an interest rate of 19% per annum for a period of 5 years, the amount payable each annum for 5 years, may be calculated from the equation mentioned before and is R5 368 per annum.

In a year of 52 weeks and a batch cycle of say 7 weeks, the amount of batches = 52 ÷ 7 = 7.44 - say 7 batches per annum. Thus, the amount payable per cycle or batch is R5 368 ÷ 7 = R767.

An economic evaluation for the unit is shown in the table below.

<table>
<thead>
<tr>
<th>ECONOMIC EVALUATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cycle/Batch</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Expenditure</th>
<th>Cycle/Batch</th>
<th>Annum</th>
<th>Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchase of chickens</td>
<td>R1 100</td>
<td>R7 700</td>
<td></td>
</tr>
<tr>
<td>Purchase of feed</td>
<td>R4 285</td>
<td>R29 995</td>
<td></td>
</tr>
<tr>
<td>Gas for heating</td>
<td>R290</td>
<td>R2 030</td>
<td></td>
</tr>
<tr>
<td>Medicine</td>
<td>R250</td>
<td>R1 750</td>
<td></td>
</tr>
<tr>
<td>Cleaning and disinfectants</td>
<td>R200</td>
<td>R1 400</td>
<td></td>
</tr>
<tr>
<td>Payment of loan</td>
<td>R767</td>
<td>R5 368</td>
<td></td>
</tr>
<tr>
<td>Total expenditure</td>
<td><strong>R6 892</strong></td>
<td><strong>R48 244</strong></td>
<td><strong>R4 020</strong></td>
</tr>
<tr>
<td>Income</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Selling of broilers @ R20.00 each (450 broilers, if 10% mortalities)</td>
<td>R9 000</td>
<td>R63 000</td>
<td>R5 250</td>
</tr>
<tr>
<td>Net profit</td>
<td>R2 108</td>
<td>R14 756</td>
<td>R1 230</td>
</tr>
</tbody>
</table>
2.3.2 Budget for layers

Layers may be bought at 18 weeks of age, or reared as pullets till 18 weeks of age. The layers and growing pullets are housed in different buildings and the economic evaluation of raising pullets may be done in the same way as for broilers. It should be possible to house one batch of layers per year and the budget below is based on that.

**Expenditure**

- **Building cost**
  
  This includes building material, site preparation, provision of water to the layer house and storage thereof, watering and feeding equipment, as well as laying nests.
  
  If it is possible to obtain a loan, the amount payable per annum may be calculated in the same way as discussed in paragraph 3.2.1.

- **Direct costs**
  
  Direct costs per batch of layers include:
  
  - Price for purchase of pullets
  - Feed for one year
  - Medication
  - Cleaning and disinfecting products
  - Bedding material (if not available from the farm)
  
  Add all these totals and this will give the total direct cost per annum.

- **Indirect costs**
  
  Indirect costs per batch of layers include:
  
  - Transport costs for feed, pullets and eggs
  - Maintenance of the building structure
  - Packaging material for eggs (if necessary)
  
  Add all these totals and this will give the total indirect cost per annum.

**Income**

The main income from layers is eggs, about 150 to 230 eggs per layer per annum. Slaughtering of the layer after a one year period provides also an income from meat sold.

Multiply the value of one layer’s eggs and meat by the total number of layers in the unit. Remember to reduce the total number of eggs and birds with 5 to 10% for breakage and mortalities. For an extra income, manure may be sold or utilised as compost.

Remember that the figures in the budget are relevant but only estimations. After the first batch, get new figures from actual records and do a recalculation of the budget.
**Example**

An economic evaluation for a 200 deep litter layer unit is shown below. Note that all numbers and amounts are estimations and may differ for different farmers and regions.

The total expenditure for the start of the unit, may be calculated as follows:

<table>
<thead>
<tr>
<th>Expenditure</th>
<th>Amount (Rand)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building materials and construction</td>
<td>R7 000</td>
</tr>
<tr>
<td>Equipment for water, feed and nesting</td>
<td>R2 500</td>
</tr>
<tr>
<td>Purchase of pullets (@ R15,00 each)</td>
<td>R3 000</td>
</tr>
<tr>
<td>Purchase of feed:</td>
<td></td>
</tr>
<tr>
<td>Layers mash (160 bags of 50 kg)</td>
<td>R11 200</td>
</tr>
<tr>
<td><strong>Total cost</strong></td>
<td><strong>R23 700</strong></td>
</tr>
</tbody>
</table>

If a loan is approved at an interest rate of 19% per annum for a period of 5 years, the amount payable each annum for 5 years, may be calculated from the equation mentioned before and is R7 750 per annum.

An annual economic evaluation for the unit is shown in the table below.

<table>
<thead>
<tr>
<th>ECONOMIC EVALUATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Expenditure</strong></td>
</tr>
<tr>
<td>Purchase of pullets</td>
</tr>
<tr>
<td>Purchase of feed</td>
</tr>
<tr>
<td>Payment of loan</td>
</tr>
<tr>
<td><strong>Total expenditures</strong></td>
</tr>
<tr>
<td><strong>Income</strong></td>
</tr>
<tr>
<td>Selling of eggs @ R6,00 doz.</td>
</tr>
<tr>
<td>Selling of layers @ R20,00 each</td>
</tr>
<tr>
<td><strong>Total income</strong></td>
</tr>
<tr>
<td><strong>Net profit/annum</strong></td>
</tr>
</tbody>
</table>
Raising brooder chickens is the first step in poultry production. The period from hatching until the chickens no longer require supplementary heat is called the “brooding period”. Day old chicks are purchased from a supplier and are supplied in a delivery box. These chicks are then raised in a brooder for approximately three to four weeks, whereafter they are further raised either for egg production as layers, or for meat production as broilers.

Warmth is essential during the first three to four weeks of the chicks’ life and therefore the importance of brooding. Natural brooding, when the hen rears her own chicks, is only suitable for very small-scale poultry production units. Artificial brooding is used for larger scale poultry production and can be divided into heaterless and heated brooders. During the brooding period, the chickens need warmth, shelter, fresh air, proper food and clean water.

![Different methods of brooding](image-url)
3.1 **Requirements of brooder chickens**

The following requirements must be met for brooders and brooder chicks:

- **Floor space**
  - At age one to four weeks, 20 birds need floor space of approximately 1.0 m².

- **Feed**
  - The chickens should have unrestricted access to feed and water.
    - Fifty brooder chicks will consume ± 75 kg of chicken mash in four weeks. In the first week, the feeders that are used, must be shallow.
    - Feeder space of 20 mm is needed per chicken.
    - If a trough feeder is used, it must have a length of 1 200 mm (one-sided) or 600 mm (two-sided) to provide enough food for one day for 50 chickens.
    - If a tube feeder is used, it must have a diameter of 300 mm to provide enough food for one day for 50 chickens.
    - For examples of feeders, see Fig. 3.2.

- **Water**
  - One brooder chick will drink up to 80 ml of water in one day.
    - Provide 10 mm drinking space per chicken, thus 100 chickens will need 1 000 mm of drinking space.
    - A drinking fount of 100 mm diameter would also be sufficient for 100 chickens.
    - The water needs to be replaced twice daily.
    - Example of water troughs and founts are shown in Fig. 3.3.

- **Light**
  - If the brooder is well lit, the chicks are encouraged to eat from day one of age. For this, natural daylight may be used, as well as electrical light or paraffin lanterns for the nights.

- **Ventilation**
  - Fresh air is important to prevent disease, which develops easily in hot, humid conditions. However, precaution has to be taken against draughts.

- **Health**
  - Wet litter must be avoided (use a 100 mm thick layer of dry, clean, chopped litter).

- **Heat**
  - Sufficient heat must be supplied to keep the environment around the chickens at a constant temperature of 30 to 32°C for age one to five days. Thereafter, the temperature should gradually drop each day to about 21°C at 4 weeks of age.
Feeding trough

Spinner

Bamboo feeder

cut out strip

short piece of bamboo

cut at two nodes

peg it at either end into the ground

50 - 80 mm diameter

Automatic feeder

hopper

trough

Fig. 3.2: Example of different feeders for brooder chicken facilities

Water fountain made from a tin and saucer

A 330 mm long water trough for 50 chicks, filled with washed stones to prevent drowning

Fig. 3.3: Example of different water troughs and founts for brooder chicken facilities
3.2 Preparation of a brooder

Before the day-old chicks arrive, there are many preparations that have to be made. Firstly, the chicken house needs to be built, whether for layer or broiler production (see Chapter 6 for the construction of a chicken house). This house or room should be airy and bright, preferably with sunlight, to keep the room fresh and dry. Containers for food and water must be bought or made, as well as sufficient brooders. Flies and mosquitoes must be controlled.

Two weeks before the arrival of the day-old chicks, the walls, floor and ceiling must be dusted and soaked with water and detergent. After an hour, this must then be rinsed with clean water. All the windows and doors must then be opened to allow the room to dry. If the room has previously been used for chickens, it is advisable to wash the inside of the room and the surrounding area with 2,0% Formalise and allow to dry. All the equipment going into the chicken house must also be washed and soaked in detergent for an hour, if used by chickens before. Thereafter, they have to be rinsed with clean water and allowed to dry. The room should then stand empty for two weeks. A few days before the chicks arrive, fresh chick feed must be bought. The day before the day-old chicks are due to be collected, everything must be made ready. The brooder must be set up where the chicks can keep warm and the heater put on (if the house is fitted with one).

Cover the floor with dry absorbent litter (wood shavings, rice hulls, chopped straw, sawdust or shredded paper) to a depth of 50 to 100 mm. Place a surround cardboard, metal sheeting or hardboard around the brooding area. The surround should be about 450 mm high to protect the chickens from draughts.

3.3 Collecting of chickens

The day-old chicks must be collected as soon as they arrive at the collection point (usually a hatchery) and checked that they are “healthy”. The chickens will be all right without food and water for only 24 hours after hatching and will therefore not have had anything to eat or drink since they were hatched. If they still have a long journey before home, then they should be given some water at the collection point.

The chicks should not get too hot or cold, else they will become sick and some will die. When they arrive at the farm, place them in the brooder as quickly as possible.

3.4 Raising chicks in the brooder

Before placing the chicks in the brooder, fill the water troughs with clean fresh water and the food trays with chick starter mash or broiler starter mash, depending on the type of chickens you have. Also sprinkle some food on pieces of cardboard or newspaper around the brooder. Gently lift the chicks one by one out of the delivery box and into the brooder. Carefully dip each of their beaks in the water, so that they can take their first drink. Make sure that they find the drinking troughs and the feeders and help any chicks which looks weak.

The floor temperature of the heated brooder should be between 30 and 32°C on the first day. The chicks must be gently pushed under the source of heat. It can be decreased slightly each week, but not below 20 to 22°C by the end of the fourth week. Table 3.1 show how the temperature can be adjusted with time, that is the temperature at the level of the chickens' back (50 mm above the litter for day-old chicks).
Table 3.1: Correct brooding temperatures

<table>
<thead>
<tr>
<th>Age (days)</th>
<th>Temperature at chick height (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>32</td>
</tr>
<tr>
<td>2</td>
<td>31</td>
</tr>
<tr>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>4</td>
<td>29</td>
</tr>
<tr>
<td>7</td>
<td>28</td>
</tr>
<tr>
<td>14</td>
<td>26</td>
</tr>
<tr>
<td>21</td>
<td>24</td>
</tr>
<tr>
<td>28</td>
<td>22</td>
</tr>
<tr>
<td>35 and older</td>
<td>21</td>
</tr>
</tbody>
</table>

A simple and effective means of brooding small numbers of chickens is to use an infra-red heating lamp. These lamps are designed for higher infra-red energy output and a lower light output than an ordinary electric light bulb. The infra-red energy passes through the air without heating it, but when it strikes an absorbing body, such as a chicken's, the energy is absorbed and transformed into heat. The litter is also heated and the surrounding air warmed by heat convected from the heated bodies. A single infra-red lamp will brood up to 50 one-day-old chicks. The lamp should be suspended 350 to 400 mm above the litter and the temperature checked by laying a thermometer on the litter directly under the lamp. The temperature can be adjusted by raising or lowering the lamp. Heat lamps should be hung securely by a chain to minimise the risk of fire. They must not be hung by the electrical lead. Because of the possibility of a lamp failing, a spare globe should be available.

For brooding small batches of chickens (up to 50) a normal incandescent 100 W spotlight globe may be used, but these are not as efficient as the infra-red lamps. For larger number of chickens and where no electricity is available, infra-red gas brooders may also be used. Another method of supplying supplementary heat, is the use of a paraffin lamp covered with a wire netting frame. This is a cheap method, but has a fire risk.

The behaviour of the chickens will help to determine whether there is too little, too much or enough heat available. If they crowd near the heat source and chirp loudly, the temperature is too low. If they move well away from the heat source and start panting, they are too hot. Ideally they should be fairly quiet and spaced evenly under and around the heat source. The chickens can be prevented from wandering away from the heat source and getting cold, by placing a barrier or guard fence around the brooder, feeders and water troughs for the first two weeks. This barrier can be moved outwards as the chicks grow and need more space until, at two weeks, it can be removed. Ventilation and sunshine are needed to keep the room dry and remove all the unwanted smells (gases) from the room.

A brooder without artificial heat is called a cold brooder. The secret with these brooders is that firstly the brooder room should be solid, sunny and warm, and secondly, the chickens must be watched and managed many times a day. So doing, any chicks, which are not eating or drinking right, will be spotted and the problem sorted out before any losses take place.
3.5 Lay-out of three cold brooder types

3.5.1 The hay box brooder

This unit is suitable for small-scale poultry farming. The box is designed to retain most of the body heat of the chicks and in so doing, to keep them warm without artificial heat. It is large enough to accommodate:

- 50 Layers to 3 weeks of age
- 50 Broilers to 2 weeks of age
- 25 Chicks to 4 weeks of age

The brooder must be the correct size in order to maintain the correct temperature for the chickens and such that there is enough floor space for them to move around freely. The size of the brooder box can be changed by changing the size of the net-tube and amount of stuffing in the box. Fig. 3.4 shows the lay-out and dimensions of a hay box brooder.

3.5.1.1 Construction of the hay box brooder

**Brooder box**

The box is 600 mm high and 600 mm square. The floor is made of 13 mm tightly stretched wire mesh or slats. The wooden frame of the lid can also be covered with either wire mesh or slats for ventilation and protection. The brooder must be vermin proof.

**Run**

The run is 1 200 mm long and has the same width as the box. It consists of a wooden frame covered with 13 mm wire mesh. The sides can be made of solid boards or planks, but the lid and bottom need to be kept partly open by using mesh or slats.

**Insulation**

The litter must be 100 mm deep in the entire brooder. A net, in the form of a tube must be placed in the box. Grass is stuffed between the net tube and the box walls to insulate the brooder box. The inside of the net tube has to be round to prevent chicks from getting stuck in the corners. During the first week of brooding, the lid can be covered with sacking or long grass during the night to keep the chicks warm and comfortable.
Frame for the haybox brooder

Dimensions for a haybox brooder for 50 chicks.

**Prepare the brooder**

- Net tube with no corners
- Stuff the haybox with dry grass

Brooder during the night

- Put feeders and drinkers in the run
- Spread dry chopped grass in the run

Regulate ventilation with a sack over the lid box

Fig. 3.4: Lay-out and dimensions for a hay box brooder for 50 chicks
The materials as listed in Table 3.2 will be needed for constructing the hay box brooder.

| Table 3.2: Materials needed for construction of the hay box brooder |
|----------------|----------------|
| Material          | Quantity and size          |
| Box                      |                                 |
| Wire mesh 13 mm      | 4 m of 1,2 m width (4 feet) net |
| Walls                 | 4 \(\times\) (0,6 \(\times\) 0,6 m) planks or board |
| Frame                   |                                 |
| 2 Laths for handles and frames | 2 \(\times\) 2,0 m; size 38 \(\times\) 38 mm |
| 2 Laths for bottom    | 2 \(\times\) 1,8 m; size 38 \(\times\) 38 mm |
| 4 Corner laths        | 4 \(\times\) 0,7 m; size 38 \(\times\) 38 mm |
| 18 Laths for frame and lids | 18 \(\times\) 0,6 m; size 38 \(\times\) 38 mm |
| 2 Laths for lid       | 2 \(\times\) 1,2 m; size 38 \(\times\) 38 mm |
| 6 Straps for hinges   | 6                                 |
| Staples and nails     | -                                 |

The cost of building materials for the hay box brooder will be approximately R150 (June 1999).

3.5.1.2 Management of the hay box brooder

For successful production, the following management aspects are to be followed:

**Food and water**
- Place the feeders and drinkers in the run. The drinkers must be cleaned at least twice a day and filled with fresh water.

**Litter**
- The floor of the brooder must be covered with hay or chopped dry grass to 100 mm depth. The corners must also be stuffed with grass to avoid piling of the chicks.

**Temperature**
- The size of the box on the inside will determine the warmth of the chicks. The correct size for the number of chicks can be controlled by the amount of stuffing. More stuffing will move them closer together for more warmth.

**Sunlight**
- The hay box brooder must be moved into the sun during the day, from the first week, for its disinfecting value.

**Sanitation**
- The brooder has to be thoroughly cleaned, disinfected and left to stand for 7 to 14 days between each batch of chicks.

**Management**
- **Week 1:** The chicks can leave the box four to six times per day to eat and drink.
- **Week 2:** The box door is left open during the day so that the chicks can eat and drink. At night they are closed again for warmth.
- **Week 3:** The door is left open permanently such that the chicks can eat and drink whenever they like.
3.5.2 The small round hut brooder

This brooder is also suitable for small-scale poultry production. Once again, the size of the brooder is of critical importance to retain the available heat from the chicks. Fifty day-old chicks can be accommodated in a circular brooder with a diameter of 1000 mm for up till four weeks of age, after which the hut can be removed. The brooder should be placed in a poultry house and surrounded by a chick guard.

3.5.2.1 Construction of the round hut brooder

This unit is suitable for up to 50 brooder chicks. No artificial heat is required, as the hut is able to retain the available heat from the chicks. The lay-out and construction of the round hut brooder is shown in Fig. 3.5.

**Construction of hut**

- Draw a circle one metre in diameter.
- Roll 13 mm wire mesh around the shape.
- Leave an opening 230 mm wide, at front.
- Cut 20 stakes, each 300 mm long.
- Fix stakes to the net, 150 mm apart.
- Wrap thin soft tree branches around the top and bottom of the net and stakes.
- Cover the wire mesh with grass.
- Use thin branches to hold the grass in place.
- Make a thatched roof that fits well over the grass walls.
- Leave no holes where cold wind can get in.

**Construction of the chick guard**

- Draw a circle of 2,0 to 2,5 m diameter around the brooder.
- Roll wire mesh 600 mm high to follow the shape of the circle.
- Clad with bamboo, brown paper or grass.
- The chick guard should be closed.

3.5.2.2 Management of the round hut brooder

**Food and water**: The feeders and drinkers can be placed in the brooder for the first few days. The drinkers must be cleaned at least twice a day and filled with fresh water. The feeders can be moved into the run after a week.

**Litter**: The brooder must be placed on a 100 mm depth of chopped litter.

**Temperature**: During the day when the temperature rises, the roof can be lifted and the opening left free. The chicks can thus receive sunlight and run freely within the chick guard circle.

**Sanitation**: All the litter must be removed and the brooder washed, disinfected and left to stand for 7 to 14 days before the new batch of chicks arrive.
Fig. 3.5: Small round hut brooder
3.5.3 Adjustable hessian cold brooder

Another type of cold brooder for 50 chickens consists of a frame of height 100 mm, 750 mm long and 600 mm wide (Fig. 3.6). The bottom of the frame is covered with wire mesh and can be set on adjustable legs above the litter. The bottom of the brooder should be 80 mm above the litter for day-old chickens and raised gradually as they grow.

Strips of hessian or plastic, 50 mm wide and 80 mm long, can be hung from the bottom edge of the frame to act as curtains. The curtains help to retain the body heat while allowing the chickens to wander in and out.

The mesh on the frame can be covered with hessian and overlaid with a 100 mm layer of wood shavings, straw or rice hulls. A second layer of hessian placed on top will prevent the chickens from scratching the litter material out of the frame. In this way the brooder is covered with a porous material which will retain the body heat, but will allow air to pass through.

The chickens should be introduced to the brooder in the evening and confined under the brooder for the first night. This can be done by placing strips of hardboard over the curtains on three sides and wire mesh over the front curtain. This will keep the chicks warm while allowing air to pass through the brooder. The wire mesh can be removed after the first night; however it may be necessary to use the hardboard strips for a few nights during cold weather.

![Fig. 3.6: Adjustable hessian brooder](image)

The chickens in the cold brooder need more attention during the first few days, but these brooders are simple to make and very effective.
3.6 Equipment used in the brooders

**Feeders**

Day old chicks - These feeders must be shallow, e.g. egg trays or pieces of cardboard (see Fig. 3.2).

One week old chicks - These chicks can use the same feeders or troughs for the rest of their period in the brooder. The side of the feeder should be 75 mm high and they should be easy to clean. They can be either bought or made by the farmer.

**Drinkers**

Day old chicks - These drinkers must be shallow and easy to drink from (see Fig. 3.3).

One week old chicks - These chicks can use water fountains or troughs for the rest of their period in the brooder. The water fountain can be made from a tin and a saucer. A hole must be made in the tin at the position of the supposed water level and a cut must be made in the edge. The tin can be filled with water, covered with a saucer and turned upside down. A bottle can also be used in the same way to provide water to a trough. The saucer or trough must be filled with small washed stones during the first weeks to prevent the chicks from falling in and drowning.

3.7 Management tips

Some management tips that will help you to be successful, are the following:

- Be quiet and careful. Noise and sudden movements can stress chicks.
- Visit the brooder often. Are the chicks eating and drinking? Are their drinkers clean?
- Remove wet or hard baked litter. Put dry fresh chopped grass or wood shavings in its place.
- Remove weak or distressed chicks from the brooder. If you cannot cure them, kill and burn them.
- Cleanliness, tidiness and no strong smells are the signs of a well-managed brooder.
- If rats can get into the room despite all precautions, cover the brooder with 13 mm wire netting at night.
- Keep records of the mass of the chicks and of feed used. Weigh them every week in groups of 5 or 10 in a bucket or a basket. Draw a graph of their weights and age to see if their growth is even and fast (see Table 3.3).
Table 3.3: Weights of egg type and meat type chicks at various ages

<table>
<thead>
<tr>
<th>Age (Days)</th>
<th>Layer chicks</th>
<th>Broiler chicks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average weight of one chick (g)</td>
<td>Food eaten by one chick in one week (g)</td>
</tr>
<tr>
<td>7</td>
<td>110 - 130</td>
<td>90 - 160</td>
</tr>
<tr>
<td>14</td>
<td>190 - 350</td>
<td>140 - 250</td>
</tr>
<tr>
<td>21</td>
<td>280 - 550</td>
<td>210 - 410</td>
</tr>
<tr>
<td>28</td>
<td>375 - 800</td>
<td>260 - 515</td>
</tr>
</tbody>
</table>

If the growth is not something like this, then you should find out why immediately. Do not buy four week old chicks from a poultry farmer if they do not weigh this at least.

- Only buy from a farmer whose management, feeding, housing and disease control is good.
- Keep records of the mass of food eaten each week. Divide this mass by the number of chicks and keep a record of this. If your figures differ from that in Table 3.3, then you are wasting food and therefore money.
- Are the chicks spilling feed?
- Are the rats eating the food?
- Is food being stolen?
- Is feed going bad, mouldy or rotten either in the bag or in the food container? You should solve these problems immediately.
- Keep feeders and drinkers clean. Chicks will get into their feed and water containers, so the water will get droppings in it. This means that for the first week or two these containers should be cleaned out several times a day and filled with fresh water and food.
- Prepare for the end of the brooding period. At four weeks of age, chicks have grown enough feathers to keep themselves warm. They do not need any more artificial heat. During their fourth week (third week in hot weather) you can raise the heater a little each day. At the end of the fourth week (third week in summer) it can be removed altogether.
- From four weeks of age broiler chicks are managed differently from layer-type chicks.

3.8 Brooders used in practice

Fig.'s 3.7 and 3.8 illustrate artificial brooding practices encountered in the field.

- It would be noted that this method of artificial brooding is used for 500 chicks or more.
- The "brooder" is actually a part of the chicken house that has been sectioned off.
- The equipment used in these brooders are all bought and not hand-made, thus the cost of such a brooding technique will obviously be higher.
Fig. 3.7: Infra-red lamp heating

Fig. 3.8: Brooding area sectioned off
CHAPTER 4

BROILER PRODUCTION

Broiler production can be very profitable and the small-scale farmer can earn a comfortable living from a small but economical broiler house. This economical broiler house must, however, conform to certain requirements.

Broilers are bought as day-old chicks. In cold areas they are kept in brooders during the first three to four weeks (see Chapter 3). At four weeks of age the brooder chickens have grown and may be able to jump out of their brooder pen and they also produce a lot of wet faeces which are quite smelly. At this age they will need to be put into a poultry house.

4.1 Housing

The poultry house should keep broilers dry, clean and comfortable at all times and needs to be secure enough to keep poultry in and vermin and birds out. The house must protect the poultry from cold winds and rain. It also needs to have good circulation of air to remove smells and moisture. The deep litter house is most suitable for broilers and should be convenient and easy to clean. It has to be disinfected after each batch of birds and it is advisable to rear and sell birds of each batch at the same time to reduce disease risk.

A simple cleaning program is as follows:

- Wash the whole unit (house) and let it dry.
- Spray the house with formalin.
- Paint walls and roof timbers with lime wash or a mixture of creosote and old engine oil.
- Leave the house empty for 7 to 14 days between batches.

Fig.’s 4.1 to 4.3 show pictures of the construction of different deep litter broiler houses used in practice.
4.2 Choice of site

The site where the broiler production unit will be constructed, needs to:

- be near a reliable market;
- be near water supply;
- have a slight slope - well drained terrain is ideal to prevent water accumulation; and
- be secure.
4.3 General design data

Floor space and covering

At least one square metre is needed for every 10 to 12 broilers. With this in mind the floor size of the broiler house can be calculated. For example 200 broilers need a floor space of $200/10 = 20$ m$^2$, thus a house of length 5.0 m and width 4.0 m would be sufficient. However, keep in mind that for larger units and houses, the width of the house must not exceed 10 m to insure sufficient and free airflow. Overcrowding of birds causes diseases to spread quickly.

The floor is best made of cement so that it can be washed and disinfected. It is covered with deep litter bedding of chopped grass, wood shavings or other organic absorbent matter, 200 mm deep. Stir the litter occasionally with a fork and remove any that is wet and caked. Keep the same floor litter for the whole production period and remove it when the broilers are slaughtered. If necessary more litter may be added from time to time to keep it dry.

House construction

Houses should be constructed from brick, clay, timber, corrugated iron or any other available material. Wall heights vary from 750 mm to 1 750 mm. In colder regions a higher wall is needed. The walls are to give the birds protection from cold winds and draughts. The area between the wall and the roof is preferably covered with a wire netting to ensure sufficient air flow to keep the birds cool in hot weather and keep the litter dry and fresh. The wire netting also helps to keep vermin, wild birds, dogs and thieves out.

In the absence of concrete floors where compacted soil is used together with a wooden frame house construction, the lower sections of the walls should be covered with iron (such as corrugated iron sheets), which should extend 450 mm into the ground to prevent mice and rats from getting into the house.

The height of the roof varies between 1 500 to 2 500 mm from ground level, depending on the type of construction. For roof covering corrugated iron sheets, asbestos sheets, timber, thatch or any other suitable waterproof material and construction may be used. However, keep in mind those materials such as corrugated iron transfer heat very well and have to be avoided in warm regions. Covering corrugated iron and asbestos sheets with materials such as shade cloth, grass and old sacks may provide insulation.

Roofs should have an overhang to keep wind-blown rain off the chicks and for shade from the hot sun in the summer. Curtains made of sacks, strong plastic or other material should be arranged so that on cold windy days, they can be unrolled to cover the wire netting to stop the chicks getting cold.

Fig. 4.4 shows the construction of a well-designed deep litter house for up to 200 broiler chicks from four weeks of age.
Water

Each bird needs 20 mm to 25 mm linear watering space, or 15 litres drinking water per 50 broilers. Feed and water troughs should be no more than two metres apart. Table 4.1 below shows in more detail the amount of water needed for each growing stage.

<table>
<thead>
<tr>
<th>Growing Stage</th>
<th>Litres / 100 birds / day</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 days</td>
<td>5</td>
</tr>
<tr>
<td>14 days</td>
<td>5</td>
</tr>
<tr>
<td>21 days</td>
<td>10</td>
</tr>
<tr>
<td>28 days</td>
<td>20</td>
</tr>
<tr>
<td>35 days</td>
<td>25</td>
</tr>
<tr>
<td>42 days</td>
<td>30</td>
</tr>
<tr>
<td>49 days</td>
<td>35</td>
</tr>
</tbody>
</table>

A drinking trough must fulfill the following requirements:

- Be easy to clean.
- Be easy to fill.
- Prevent birds from contaminating the water.
- Prevent splashing on the litter.
- Contains enough water for at least 24 hours.

Drinkers should be made of non-corrosive material like galvanized iron, plastic or burnt clay. All birds need a drinking place within a distance of three metres. Automatic drinkers are easily made using a 10 to 15 litre empty tin and a container. A small hole is made in the side of the tin and a cut is made at the edge. The hole should be made at the same level as the drinking water and the basin at least 100 mm deep. The hole, about 2.0 mm diameter should be made 50 mm from the edge. Fill the tin with water, cover it with the basin and then turn it upside down. The water should now reach the level of the hole in the side (see Fig. 4.5). A two-litre soft drink bottle can also be used as seen in Fig. 4.5. It is necessary to hang or support the drinkers so that their lips are the same height as the chick's backs. This helps to stop droppings and litter from spoiling the water.
Old car tyres make excellent drinkers and feeders and will cost the prospective producer nothing. Fig. 4.6 shows how to make drinkers and feeders out of a car tyre. It is important to make sure that the tyre feeders and drinkers are well cleaned before being used. A small tank could be put on a roof height stand right next to the house for water supply (see Fig. 4.7). A polyethylene pipe can run from the tank, down the middle of the house against the roof, one end to the other end, and is plugged on the far end. Commercial type poultry drinkers are fastened to this water pipe as shown in Fig. 4.8.

Fig. 4.5: Home made automatic water drinkers
Fig. 4.6: Inexpensive tyre water drinkers
Fig. 4.7: Water supply tank

Fig. 4.8: Fastening of commercial type water drinking systems

1. Drill 6.5mm hole into pipe
2. Fit coupling over hole and screw in drinker pipe connection

Water supply pipe

Poultry house

Water tank

Polyethelene pipe

Tank stand

String attached to beam

Adjustable rope
Feed

The birds should feed regularly and always have access to feed. Each bird needs about 100 mm of feeding space. A trough type feeder, commercial feeders or low cost tyre feeders as for water, may be used.

At the end of the fourth week feed has to be changed from broiler starter mash to broiler finisher mash. Change feed gradually over several days and mix the two types of feed well before putting it into the feeders. Table 4.2 gives an indication of how feed should be change over.

<table>
<thead>
<tr>
<th>Table 4.2: Changing of feed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>1st day</td>
</tr>
<tr>
<td>2nd day</td>
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<tr>
<td>3rd day</td>
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<tr>
<td>4th day</td>
</tr>
<tr>
<td>5th day</td>
</tr>
<tr>
<td>6th day</td>
</tr>
<tr>
<td>7th day</td>
</tr>
</tbody>
</table>

Broiler feeds are different from feeds for layers. They contain more starch and protein. Do not give broiler feed to layers and layer feed to broilers.

Ventilation

Ventilation means “free flow air” and provides oxygen and removes moisture, odours and excess heat in hot weather. In practice the ventilation of the open shelter may present a few problems as long as low temperatures are acceptable in winter. The main difficulty here is to avoid through-draughts and to ensure that the open side faces the most favorable direction, which is generally towards the south (Fig. 4.9). The long side is exposed to the prevailing wind.

Younger broilers are relatively easy to ventilate. In this case there are usually no problems because the actual demands are so small and by-products from the birds are minimal.

In areas where temperatures can drop below 5 to 8°C, curtains can be used to protect the birds from cold air. It can also be used to protect the birds from direct sun radiation by covering the exposed side only.

If asbestos or iron sheets are being used as roof material, there is a need for extra ventilation to prevent heat build-up. The problem can be solved by an opening in the ridge of the roof to let out the hot air, or by a cooling effect as described previously.

Temperature

Ventilation should ideally be able to maintain the temperature inside the poultry house between 18 and 25°C day and night and the humidity at no more that 65%, day and night. These can be measured on a maximum-minimum thermometer and a wet and dry bulb thermometer. The correct temperature and ventilation helps the broilers to grow at the maximum rate. The use of thatch or white paint on the roof lowers the temperature. Use curtains or other covers for the wire mesh to prevent drops in temperature during cold nights. Use insulating material such as thatch and brick to build the house. Table 4.2 gives more specific temperatures for every week in the growing stage.
Table 4.3: Temperature requirements for each week

<table>
<thead>
<tr>
<th>Age (Days)</th>
<th>Complete house warming °C</th>
<th>Specific area warming °C</th>
<th>Home</th>
<th>Specific area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>31</td>
<td>26</td>
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<td>40</td>
<td>21</td>
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<tr>
<td>49</td>
<td>21</td>
<td></td>
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</tbody>
</table>

Heating

In colder regions it is advisable to provide extra heat to broilers to maintain the temperatures as indicated in Table 4.3. Systems available are:

- Infrared heaters (gas or electricity)
- Paraffin lamp heaters

The system decided upon would depend on the availability of the fuel (e.g. electricity, gas or paraffin). The manufacturers of these systems provide specifications on how many and the type and size of heaters to be used for a specific size unit.
CHAPTER 5

PLANNING SYSTEMS FOR LAYERS

5.1 Introduction

The demand for eggs increase by the day as more and more people become aware of the tremendous nutritive value of the egg.

Starting out as an egg producer can be very expensive if the prospective farmer wishes to establish a modern laying battery system. However, the secret to success is not to start too big. Start a small project and once one has gained the necessary experience, and the project is a success, then only start thinking along the lines of expansion and then only as far as the market will allow.

5.2 Basic planning data

5.2.1 General

Laying hens can be brooded and reared as chicks and pullets, or if you want to start selling eggs quite soon, or if you want to specialise only in egg production, 18 week old birds can be bought from poultry agents.

These birds are kept in the laying accommodation from 18 weeks of age till laying starts at 20 to 25 weeks of age. Different housing facilities, constructions and equipment are available and will be discussed in the following sections.

5.2.2 Different layer systems

5.2.2.1 Fold unit

The fold unit (see Fig. 5.1) is suitable for small farms and is a moveable house and a run combined. The unit is systematically moved over an area of grassland, to avoid infections and give new pastures for the layers. Management and lay-out on big fold units are high. The unit must be moved daily to a fresh piece of land and not be returned to the same spot or area for about 30 days.

The ideal site for this type of layer accommodation is flat land with light, well-drained soil and with short cut grass pastures. Each unit needs about 160 m² of pasture and each layer needs 0,30 m² of floor space. For a general quantity of 16 layers per fold unit, 5,0 m² of floor space are needed.

If communal nests are used for laying, it should have a floor space of at least 0,25 m² for 16 layers. The opening of the nest should be 250 × 250 mm in size, with triangular shaped sides, each 1,5 m long and made from timber (size 114 × 25 mm), boards or other suitable material. If single nests are preferred, one nest is suitable for four layers. So for 16 layers one communal nest of size 500 × 500 mm, or four single nests are needed.

The recommended size for single nests is 250 to 300 mm wide, 300 to 380 mm deep and 300 to 350 mm high, depending on the size of the layers. For more information on nests and the construction thereof, see section 5.3.1.
Frame for a fold unit

Frame covered with netting

Completed unit for 16 layers

Fig. 5.1: Lay-out of a fold unit
The feed requirements of layers are about 120 grams layers mash per bird per day, or two kilograms per day for a total of 16 layers. Two meters of linear feed space is required for a unit of 16 layers. Troughs are attached along the side of the unit to be filled by hand from the outside. For 16 layers about five litres drinking water is needed per day in a water trough or a fountain drinker. Linear water trough space needed is about 250 mm for 16 layers.

Perches for layers should be round, 30/50 mm in diameter and placed 200 mm to 250 mm apart. Perch space requirements are five layers per meter of perch length, or about 3,2 m perch length for 16 layers. For the 16 fold unit, place four perches, 50 mm in diameter and 1 200 mm long, 250 mm apart and 300 mm above floor level.

The frame of the fold unit can be constructed from locally available materials and must be especially strong at the corners and handles. The frame is 3,5 m long, 1,5 m wide and the sides 1,5 m high. Laths of size 76 × 50 mm or poles of size 50/75 mm diameter may be use and joint by nails or plain wire. A strong wire netting floor is needed to protect birds from predators and to prevent injury or escaping when the unit is moved.

The gable in the nesting area should have a door for removing eggs and changing litter. The nest box floor is wire mesh, planks or poles covered with litter. The roof in the nesting area is a wire mesh port, which is covered with thatch.

The door to the fold unit has a doorframe of width 700 mm and height 1 500 mm, covered with net wire and constructed of 50 × 38 mm laths. The doorframe should be braced and as an example old car tires may be used as hinges.

The entire unit should be covered with three parts of wire mesh, each of size 3,5 m length and 1,5 m width, thus 10,5 m length in total. The wire mesh should be tightly stretched to avoid sagging. The nest box and resting area where the perches are placed should be covered with thatch, or any other suitable material. Fig. 5.2 shows the construction detail of one side of a fold unit.
Table 5.1 gives an indication of the type and quantity of building materials, as well as costs needed for constructing a fold unit for 16 layers.

<table>
<thead>
<tr>
<th>Material description</th>
<th>Length/Size</th>
<th>Quantity</th>
<th>Costs (June 1999)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timber laths (76 x 50 mm)</td>
<td>3,5 m</td>
<td>3</td>
<td>R91,70</td>
</tr>
<tr>
<td></td>
<td>1,8 m</td>
<td>1</td>
<td>R15,75</td>
</tr>
<tr>
<td></td>
<td>1,6 m</td>
<td>1</td>
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</tr>
<tr>
<td></td>
<td>1,4 m</td>
<td>10</td>
<td>R122,25</td>
</tr>
<tr>
<td>Timber laths (50 x 38 mm)</td>
<td>0,65 m</td>
<td>3</td>
<td>R7,30</td>
</tr>
<tr>
<td></td>
<td>1,35 m</td>
<td>2</td>
<td>R10,10</td>
</tr>
<tr>
<td></td>
<td>1,375 m</td>
<td>1</td>
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<tr>
<td>Timber planks (114 x 25 mm)</td>
<td>1,2 m</td>
<td>4</td>
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<tr>
<td></td>
<td>1,3 m</td>
<td>3</td>
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<td></td>
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<td>3,6 m</td>
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<tr>
<td>50/75 mm diameter poles</td>
<td>1,8 m</td>
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<td>R34,75</td>
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<td>30/50 mm diameter poles</td>
<td>1,2 m</td>
<td>4</td>
<td>R5,05</td>
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<tr>
<td>Wire mesh, 13 mm</td>
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<td>3</td>
<td>R260,00</td>
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<tr>
<td>Round wire nails</td>
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<td>1 kg</td>
<td>R10,00</td>
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<tr>
<td></td>
<td>42 mm length</td>
<td>1 kg</td>
<td>R5,00</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td><strong>R701,20</strong></td>
</tr>
</tbody>
</table>

5.2.2.2 Poultry run system

The advantage of a layer house with an outside fowl run, is that the layers can benefit from the sunlight and pasture. However, the system could be expensive depending on the amount of netting for the run.

The poultry run system consists of a house and a well-drained exercise area enclosed by wire netting (see Fig. 5.3). The house must be equipped with perches, nests and feed and water troughs (see Fig. 5.4).

Fig. 5.3: Foul run for 25 layers
The size of the house and run is determined by the quantity of layers and the guideline is that each layer needs about 5,0 m² in the run area and 0,2 m² in the house. Thus a system for 25 layers requires a run area of 125 m² and a house of 5 m². The run would use about 50m length of 2,0m high wire netting.

For laying, six single nests or one communal nest with a floor space of at least 0,24 m² is needed for 25 layers.

Feeding is done by hand in a trough or tube feeder. The total length of trough needed, if it is accessible from both sides, is 1,0 m for 25 layers. Water trough space requirement is 250 mm linear space, or a fountain containing one day's need of water (about 5 litres).

Perches should also be provided to the layers at 200 mm length per hen. A system of 25 layers thus needs 5,0 m perch length and perch diameter of 50 mm. Perches are provided at a height of about 600 mm above floor level.

5.2.2.3 Deep litter systems

This is an intensive layer system because poultry are kept indoors all the time and very little space is necessary. A layer of 200 mm fresh litter is put on the floor, in a similar way than with deep litter broiler houses. The litter should be removed from the house and put into a compost heap at the end of the hens' laying cycle, that is approximately every 12 months.

The number of birds per square metre floor space depends on the size of the unit and the breed of layers. Recommendations on floor space for different unit sizes are given in Table 5.2.
In a deep litter system communal or single nests may be use for laying. Communal nests should have an area of at least 0.015 m² per layer and one single nest is suitable for four to six layers. The space requirements, sizes and lay-out of perches are the same as for the poultry run system.

In the deep litter house feed is placed by hand in troughs or tube feeders. The required linear feed space is about 60 mm per bird. Drinking water can be provided in drinking troughs or water fountain containers for drinking troughs. About 15 mm linear drinking space is required per bird.

Table 5.2 gives information on the design data and house dimensions for deep litter systems of 25, 50 and 100 layers.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>25 Layers</th>
<th>50 Layers</th>
<th>100 Layers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floor space</td>
<td>6.25 m²</td>
<td>10 m²</td>
<td>20 m²</td>
</tr>
<tr>
<td>Communal nests</td>
<td>0.4 m²</td>
<td>0.75 m²</td>
<td>1.5 m²</td>
</tr>
<tr>
<td>Single nests</td>
<td>6</td>
<td>10</td>
<td>16</td>
</tr>
<tr>
<td>Linear feeding space, both sides</td>
<td>1.5 m</td>
<td>3.0 m</td>
<td>6.0 m</td>
</tr>
<tr>
<td>Linear drinking space</td>
<td>0.4 m</td>
<td>0.75 m</td>
<td>1.5 m</td>
</tr>
<tr>
<td>Capacity of fountain drinkers</td>
<td>7.5 l</td>
<td>15 l</td>
<td>2 x 15 l</td>
</tr>
<tr>
<td>Total perch length</td>
<td>5 m</td>
<td>10 m</td>
<td>20 m</td>
</tr>
<tr>
<td>Base size of house</td>
<td>3.0 x 2.1 m</td>
<td>2.5 x 4.0 m</td>
<td>3.5 x 5.8 m</td>
</tr>
<tr>
<td>Height of lower wall</td>
<td>0.5 - 0.6 m</td>
<td>0.6 - 0.8 m</td>
<td>0.6 - 0.9 m</td>
</tr>
<tr>
<td>Height of upper wall (mesh)</td>
<td>0.5 - 0.6 m</td>
<td>0.9 - 1.2 m</td>
<td>0.6 - 1.2 m</td>
</tr>
<tr>
<td>Total height for gables</td>
<td>2.4 m</td>
<td>2.8 - 3.2 m</td>
<td>3.4 - 3.8 m</td>
</tr>
<tr>
<td>Overhang</td>
<td>0.5 m</td>
<td>0.5 m</td>
<td>0.5 m</td>
</tr>
</tbody>
</table>

The lay-out and construction of a general deep litter layer house is the same as for a poultry run system (but without the run area) and is shown in Fig.’s 5.3 and 5.4.

5.2.2.2 Deep litter and slatted floor system for 200 layers

The lay-out and construction of these houses are basically the same as for the deep litter system, except that feed and water are provided on an above ground slatted area with a dropping pit.

As in the case of the general deep litter system, the number of birds per square meter depends on the size of the unit and the breed of layers. For 200 layers on deep litter and slatted floor, a density of 0.14 m² per layer is recommended, or in total 28 m². Single nests are used and for 200 layers, 30 nests are needed.

Feed is put by hand in troughs or tube feeders. Two hundred layers need about 12 m of linear feeding space and 60 litres of drinking water per day, which are provided in four fountains containing 15 litres each.

Half of the floor space (thus 14 m²) should be equipped with a slatted floor above a dropping pit. The slatted floor is built of 13 mm wire mesh, or gum poles of 50/75 mm diameter and placed 25 mm apart. The slatted floor is placed at a height of about 500 to 600 mm above the solid floor level (see Fig. 5.5). A wooden board, brick or wire mesh front-cover should be constructed. If a slatted floor is used over the dropping pit, the slats will serve as perches. If wire mesh is used, 40 m of perch length should be placed over the dropping pit. The pit is cleaned once a year when the layers are culled. The manure can either be used as compost on the farm or sold for a profit.
The main measurements of a deep litter and slatted floor house for 200 layers are as follow:

- Base: 4.0 x 7.0 m
- Height of lower wall: 0.8 to 1.0 m
- Height of upper wall (mesh): 0.9 to 1.2 m
- Total height for gables: 3.8 to 4.7 m
- Overhang: 0.5 m
5.2.2.3 Battery system

Some poultry and egg producers use this more intensive and sophisticated method for egg production by layers. It is a type of “factory” farming where the layers are kept in cages arranged above the floor in a weatherproof and ventilated chicken house.

Droppings fall through the wire bottom of the cage onto the floor. Eggs are laid on the wire and roll forward out of reach of the hens. Up to five layers live in one cage and food is usually restricted so that the hens do not get fat and stop laying eggs.

The battery method is lay-out- and space saving. It is comparatively easy to feed and water the hens, collect the eggs and check on their health. Droppings are easy to remove from the floor and no litter is needed.

The battery cage method is a relative expensive method to set up and is also thought by many people to be inhuman. Fig. 5.6 shows the systematic lay-out of such a system.

![Fig. 5.6: Lay-out of a three tier battery laying system](image)

5.3 Fittings and equipment for layers

5.3.2 Nests

Laying nests constructed of timber, could either be of the communal or the single type. In a hot climate, well ventilated nests with small perforations at the back of the box, are recommended. Nests should be deep and dark and designed in such a way that nest material can not be easily scratched out. A 60 mm high lip in front of the opening to the nest would be sufficient for above-mentioned purpose.

Nest boxes may be construct from timber, metal, bricks or concrete slabs (see Fig. 5.7). Single nests should be 250 to 300 mm wide, 300 to 380 mm deep and 300 to 350 mm high, depending on the size of the layers. A landing board or a perch should be attached 100 to 200 mm from the front of the nest on each tier (see Fig. 5.7). The number of nests depends on the size of the groups of birds as discussed in paragraph 5.2.
Individual nest box for 50 hens.

Communal nest box

Lid for egg collecting

25 layers

Lid

Nest

Landing board

a = 1,00 m for 50 layers
a = 2,00 m for 100 layers

Fig. 5.7: Lay-out of different nesting boxes
Single nests can be placed in one, two or three tiers above each other. The lowest should be raised at least 600 mm from the floor or ground level, otherwise hens tend to crawl underneath these nests and lay there. Nests should preferably not face the light, because dark conditions reduce egg eating.

The communal nest is a large nesting box in which every six layers needs a floor space of $300 \times 300$ mm or $0.09 \text{ m}^2$. The nest should be dark on the inside and have a shutter for egg collecting.

Nests boxes may be arranged so that the eggs can be collected from outside the shed. Alternatively an open-topped nest with three or four compartments can be placed just inside the door so that eggs can be collected without going into the pen.

### 5.3.3 Feeders and drinkers

Any form of mechanised feed distribution would be too expensive. The most economic way of feeding distribution is to use a bucket of capacity 10 to 20 litres and a feed scoop.

Feeders may be designed as troughs or as tubes. These feeders can be bought ready-made, but especially troughs can be easily made (see Fig. 5.9). The feeders are placed directly on a slatted floor, or in houses with deep litter, or in outside runs. They should preferably be fitted with stands.

The troughs should not be too deep, to enable the birds to reach the feed easily and must have a retaining lip to prevent spillage and wastage. The rim of the troughs should be the same height as the back of the birds and troughs should have a spinner at the top to prevent birds standing in the trough.

Feed should be stored in bags in a dry room protected from pests and insects. For larger units a separate lockable storeroom should be built closely to the poultry house. Feed bags should be stored on a slatted wooden floor. A storeroom of 1.5 to 4.0 m$^2$ area is recommended, depending on the size of the unit. A layer eats about 3.5 kg of Layers mash in one month.
Dry mash feed trough: Function of lip

Home made trough

Food dropped onto lip

subsequently falls into trough

150 mm

150 mm

Deep-litter feeding trough

430 mm

380 mm

230 mm

180 mm

120 mm

50 mm

600 mm

750 mm

Hanging tube feeder

Fig. 5.9: Construction of feeding troughs
Drinking troughs should be designed to contain enough water for at least 24 hours and should be made of non-corrosive material, like galvanised iron, plastic, or burnt clay. All layers need a drinking place within a distance of three meters.

Automatic water drinkers are easily made, using a 10 to 15 litre empty tin and a container (see Fig. 4.5). A small hole is made in the side of the tin and a cut is made at the edge. The hole should be made at the same level, as the drinking water will be. The basin should be at least 100 mm deep and the hole, about 2.0 mm diameter, should be made 50 mm from the edge. This type of drinker is easy to take apart and clean. Drinkers can also be bought ready-made.

5.4 Temperature and light

Keep layers comfortable. Between 11 and 26°C layers produce most eggs and eat a minimum of food. Below 11°C more feed is eaten to produce eggs. Above 26°C, less feed is eaten and less eggs are laid. Above 35°C the layers pant a lot, stop eating and do not lay any eggs. When temperatures are high you can cool down the layers by spraying the roof, and even the hens, with water. If the hot weather lasts for a few days, you should paint the roof white or cover it with grass or shade cloth and open all windows and doors wide.

If the layers often get heat stress in summer (e.g. Lowveld conditions) then the poultry house should be altered and fewer layers kept in the house. Suggestions for house alterations are:

- Replace a metal roof with asbestos or thatch.
- Raise the height of the roof.
- Remove rows of bricks in the side walls and replace with wire netting.

In places that have cold, windy weather you can cover the netting with hessian or plastic or have solid brick walls up to the eaves on windy sides. Layers are more comfortable and produce more eggs if there are no smells in the house and the litter is dry. Fresh air (but not draughts) moving through the house will remove excess moisture and smells. Natural ventilation and a well-designed poultry house will ensure this.

Layers need fifteen to sixteen hours of light each day in order to produce the maximum number of eggs. The best way to provide this is to have electric lighting in the poultry house. Two 40 watt electric light bulbs, three metres apart and hung two metres above floor level, are enough for a poultry house of size 12 × 3,0 m (36 square metres) containing 100 layers. The lights could be switched on from 5 a.m. (05h00 hours) till dawn, then again from dusk until 9 p.m. (21h00 hours) every day. However, it is best to provide extra light in the morning, because if the light is turned off suddenly during darkness, the hens will be unable to find their perches. Gas or paraffin lamps are not safe or as easy to use, but can be carefully used where there is no electricity.

5.5 Managing the laying flock

To secure a high rate of egg production, it is essential to ensure that pullets and layers are well bred, reared, fed and managed throughout the growing period.

Modern hybrid layers properly fed, housed and managed, will produce over 230 eggs per layer in twelve months. Well managed pure breeds may produce 200 eggs and indigenous birds 150 eggs during the same period of time. Good layers can lay well for only 12 to 14 months, so keep layers only for this period.
When production is over 0.6 eggs per hen per day, only sick birds should be culled. However, when production is below 0.6 eggs, introduce culling on poor birds. The profit will increase by saving feed and getting cash for the meat of these poor layers. When production is below 0.45 eggs per hen, cull the entire flock and replace with a new one. The operation of handling and culling must be done smoothly and quietly. All dead birds have to be burn or buried.

Collect eggs at least three times a day and change nesting material every forth night. Wood shavings, clean dry grass or straw are all adequate for nesting material. Do not wash eggs because dirty water might infect them. Dirty eggs should be cleaned with a damp cloth.

Wood shavings, chopped veldt grass and maize residues are all suitable for litter. Add litter to a depth of at least 100 mm before housing. More litter has to be added from time to time to keep the bed dry. Wet cakes or wet litter must be removed immediately. The litter may be forked over continually, every second day for the first three weeks. After this time the bacteria should be working so that it is necessary to stir the litter only occasionally with a fork. Floor litter is only removed when all the layers are sold and the house is to be cleaned and disinfected.

Poultry manure is valuable fertiliser. A layer produces about 150 to 200 g of manure daily. Litter and manure from the poultry house should not be left in a wet heap and should also be covered from rain. It should be spread out to dry and then stored in a dry place. Dried manure could be sold in bags for cash, or spread on crop fields, orchards and vegetable gardens as compost.

A typical management program is shown in Table 5.3.

<table>
<thead>
<tr>
<th>Table 5.3: Management program</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Management daily</strong></td>
</tr>
<tr>
<td>Check the poultry for signs of disease</td>
</tr>
<tr>
<td>Check the environment - temperature</td>
</tr>
<tr>
<td>Clean drinkers and provide fresh drinking water</td>
</tr>
<tr>
<td>Check feeders and clean if necessary, provide fresh feed</td>
</tr>
<tr>
<td>Check litter, remove wet cakes</td>
</tr>
<tr>
<td>Collect eggs three times a day</td>
</tr>
<tr>
<td>Keep records and check for deviations</td>
</tr>
</tbody>
</table>

If hens stop laying eggs, one or more of the following may be the reason:

- **Moulting**

  It’s a natural process in which a hen loses its old feathers and replaces them with new ones. While moulting, hens will stop laying for up to three months, depending on their age. Normally hens moult or nest once a year. Moulting as a reaction of stress causes hens to stop laying or to lay at a reduced rate.

- **Stress**

  Stresses such as moving, handling, chilling, overheating, beak trimming, lack of water and fright, can cause moulting or a drop in egg production.
Decreasing daylight

Decreasing daylight frequently causes hens to moult and to stop laying eggs for about two months if they are receiving only natural light, and especially if they have been laying for a long time. To prevent this, supplementary daylight should be provided to maintain a constant daylight length of 15 to 16 hours.

Disease outbreaks

Disease problems can occur even under the best conditions. Often the first sign is a drop in feed consumption followed by a decline in egg production. Other symptoms include moultng, dull and listless appearance, coughing, lameness and death. Remove wet litter as soon as possible to avoid a build-up of worms and other parasites.

Age of the flock

The older the hens are, the fewer eggs they will lay. Egg laying will be interrupted by annual moults and sometimes even two moults a year for older hens. For economic reasons it is usually good practise to replace hens after two laying seasons.

Feeding

Hens need to be fed a balanced diet if they are to lay well. This means that they require a daily ration of energy, protein, vitamins and minerals. Hens will lay on a diet of grain, green feed and kitchen scraps; butt egg numbers will be lower than if they are fed a correctly balanced diet. If the diet is deficient in calcium, the hens will lay more soft-shelled eggs.

Water

Hens must have a supply of cool, clean water at all times.
6.1 Getting started

Choose a suitable site for the building. This site must have the following characteristics:

- Well drained
- A windbreak and some shade
- A reliable and sufficient water supply

The number of chickens that will be reared or kept as layers, will determine the size of the poultry house. Once the size of the building has been established, a bill of quantities must be set up to determine what building materials, which are readily available, can be used and which ones need to be purchased.

All the materials needed have to be collected and brought to site just before the building needs to be constructed.

6.2 The foundations

A high quality foundation will ensure that the building stands for many years. The foundation can be made from concrete, stone, brick, poles or any other suitable and reliable material. It is possible to lay the walls on levelled ground without any foundation, but only if the site is dry, the ground is hard and the building small. This however, is not to be recommended. With this first step in building construction, the soil must also be treated against ants and termites.

6.2.1 Concrete foundations

The position of the building has to be marked and the site cleared. The depth of the foundations should not be less than the thickness of the walls and the width of the foundation should not be less than three times the thickness of the wall (see Fig. 6.1).
The trenches and back-fill soil must now be treated with anti-termite pesticide or used engine oil. The concrete has to be mixed and then the trenches wetted before the concrete mixture is cast. The following proportions should be used for the concrete mix:

Concrete mixture
- 1 part cement
- 4 parts sand
- 8 parts coarse gravel
- Water to a workable mix.

The mixture must be stiff and compacted with rammers until the surface is wet, but not more than that. After the concrete has been cast, it should be protected with wet, empty cement or grain bags, a straw mat or a similar covering against rain, sun and wind. The surface is normally hard one day after casting, but the concrete must be kept wet for five days by watering it every morning and evening. The backfill must be compacted to facilitate a stable foundation attachment.

6.2.2 Stone foundations

A stone foundation is preferred on stony sites to save cement. The stones used must be as large as possible and the remaining spaces filled with smaller stones and cement mortar. Fig. 6.2 shows the dimensions of a stone foundation.

Mortar mixture (by volume)
- 1 part cement
- 4 parts sand
- 6 parts coarse gravel
- Water to a workable mix.

When laying the mortar, it is good practice to do the following:

- Clean the stones for effective adhesion.
- Place the first layer of stone in mortar, not directly on the ground.
- Let the stones overlap each other as far as possible.
- Kept the joints as narrow as possible.
- Filled the cavities well with mortar.
6.2.3 Burnt brick foundations

A burnt brick foundation may be used on dry sites (Fig. 6.4). They are cheap and easy to build.

Mortar mixture (by volume) -
- 4 part cement
- 1 part lime
- 12 parts clean sand
- Water to a workable mix.

When laying the foundation, the bricks must be soaked before building. The first layer of bricks should be placed on 40 mm of mortar and the layers afterwards staggered to form good bonds.

6.2.4 Pole foundations

Gum poles can also be used for simple, yet adequate, foundations. These foundations must, however, be carefully constructed else they will be subject to damage and must also be protected against ants and termites. The holes have to be dug in dry, firm ground. Use poles that are as straight as possible and place them in a concrete footing or on a flat stone base. Poles of diameter 125/150 mm should be used. The back filling must be well compressed.
Fig. 6.4: Dimensions for brick foundations

Fig. 6.5: A pole foundation

Hole filled with earth (no top soil) or sand and gravel, or earth-gravel-cement mixture. Backfill compressed in layers.

Excavate the hole for pole in such a way that if possible the pole can be leaned against natural soil.
For termite protection:

- Paint or soak the poles in a solution of water with Ganalin 20, or a mixture of used engine oil and diesel.
- Pour a new treatment around the pole every two to three years.
- Use pure pit sand, well compressed as backfill.
- The poles can be wrapped in plastic.

### 6.3 The floor

The floor of the poultry house should be well drained, easy to clean and prevent rodents from entering the house. It could consist of concrete, stabilised earth, anthill soil or well-drained soil. For drainage, the floor should slope slightly towards the entrance.

#### 6.3.1 Concrete floor

The floor base as well as the quality of the concrete is important when laying an effective, strong concrete floor (Fig. 6.6). The concrete must also be supported over the whole of its area to avoid cracks.

**Base**

For an effective base, a 100 to 150 mm thick bed of hard-core, consisting of stones, can be used. The stones should be of varying sizes and packed correctly to form a good barrier against capillary transported moisture.

**Floor**

The concrete mix by weight is as follows:

- 1 part cement
- 3 part sand
- 6 parts gravel
- Water to a workable mix.

![Fig. 6.6: Good hard core construction](image-url)
Whilst the concrete is being laid, it must be thoroughly compacted with a heavy tamping beam. If water appears on the surface, then the water content is too high. After compaction, the floor must be levelled using slats as a support for the strike board (Fig. 6.7). The floor slab should have a final thickness of not less then 50 mm. The concrete floor, which should now be stiff but still plastic and workable, must be left for one to two hours to set and then further, smoothed out with a steel trowel. See under “concrete foundations” for curing instructions.

Fig. 6.7: Leveling of concrete floor with a strikeboard and slats

6.3.2 Earthen floor

This is the cheapest method of constructing floors (Fig. 6.8).

Base

A base is constructed in the same manner as for the concrete floor.

Floor

The floor is laid on top of the sub floor in three 40 mm layers. A good earth floor needs to be stabilised to last for a long time. To stabilise it, soils, cement, slaked lime and sand or clay is added. If a soil is sandy, then clay must be added and if a soil is clayey, then sand must be added. After that a 5% cement for sandy soil or 10% cement for clayey soil is added to the dry soil and is mixed well.

The last layer should preferably have more stabiliser than the others. The floor is then laid and the last layer smoothed out and left to cure under moist conditions for one week. Wet sacks, grass or straw can be used to keep it moist. If anthill soil is available, it could be used in the same way as stabilised earth.
6.4 Walls

The walls of the chicken house must be effective in keeping predators out and keeping the chickens inside.

The lower wall (600 to 1200 mm high) can be made of mud, stabilised blocks, burnt bricks or treated wood. For extra protection, it can also be plastered. This lower wall serves to protect the birds from excess sun and draughts. The upper wall (900 to 1200 mm high) should consist of slats or 13 mm wire mesh which will be small enough to keep wild birds and rodents out. A tight fitting door is essential in keeping out draughts and predators. Treated gum poles which are set 500 mm deep in concrete or on a flat stone base, can be used to support the roof and upper walls of the structure.

Clay wall

Clay is plastered onto a framework of sticks from which all the bark is removed. These walls must be maintained regularly by smearing clay on the surface to fill cracks and holes. Clay walls provide good protection against wind and sun but have little resistance against rain, ground moisture and external mechanical forces. The load bearing capacity of these walls are very low, thus additional support will be needed for carrying the roof.
**Clay bricks**

Clay bricks, which are sun dried, are an excellent building material when available. The bricks should be laid in mortar, on a proper foundation of concrete or stones, well above the ground level. The roof of the building should also have an overhang of 400 to 600 mm. Clay brick walls should preferably be plastered.

**Soil cement blocks**

Soil cement blocks are clay blocks, which are stabilised with cement. Soil, cement and water are mixed together and formed in a mould. Depending on the characteristics of the soil, the cement-soil ratio can vary from 1:7 to 1:15.

**Burnt bricks**

Burnt bricks are made of clay, formed in moulds and burnt in kilns. The clay composition and burning process determine the quality. Local entrepreneurs can make these bricks. If locally made bricks are bought, then it is recommended that 20% extra be bought to replace those that have been unevenly burnt or have to be rejected. Before the bricks are laid in mortar, they must be soaked in water.

The mortar mix by volume is as follows:
- 1 part cement
- 4 parts pit sand
- Water to a workable mix.

Fig. 6.9 illustrates the lay-out of a house structure including the foundations, floor, walls and roof.

![Diagram showing the house structure](image-url)
6.4.1 Plaster

The plaster mix is the same as that for mortar. It is applied with a brick trowel and smoothed out with a wooden float. Walls made of clay or that are sensitive to pecking, should be plastered up to a height of one metre above ground level for protection. The walls and plaster should be free of cracks and as solid as possible for better control of insect and pests.

Bagging can also be done on the walls instead of plastering, as it uses less material and is therefore cheaper. This is done by rubbing a plaster paste on the walls with a bag or stiff brush until the surface is smooth. Its main purpose is to fill all the cracks and hollows. Fig. 6.10 shows the techniques of plastering and bagging.

![Plastering techniques](image)

**Fig. 6.10: Plastering and bagging techniques**

6.5 Roof

The roof must be waterproof, have a smooth surface to prevent insects living in it and give a good temperature in the house. For roof covering use thatch, iron sheets or asbestos sheets.
6.5.1 Thatched roof

This is a cheap method of roofing, which also gives good climatic conditions. The materials most commonly used are grass and palm leaves. A fine wire netting can be nailed to a frame of timber laths, to prevent snakes and rodents from entering. The effectiveness and quality of the thatched roof depends on how well the thatch is laid and what quality of thatch is used. It is important that the house is cleaned well to remove dust and grass, which may fall on the floor, before the birds are introduced to the house. Apart from being able to harbour snakes and insects, thatch also catches fire easily, so great care must be taken in the vicinity to prevent fires.

The process of laying thatch starts at the eaves. Thatch is laid on and tied to a wooden frame of laths or sticks. The grass is tied into bunches that overlap each other by two thirds of their length. The grass must be laid in such a manner that the final thickness will be 100 to 150 mm. A minimum slope of 1:1 or 45° is required to drain off rainwater.

If the thatched grass gets infested with insects, it will have to be burnt and replaced.

![Fig. 6.11: A thatched roof](image)

6.5.2 Iron sheets

Corrugated iron sheets are more expensive than thatch and are unable to provide such good climatic conditions as thatch. They are, however, waterproof, easy to clean, will not lodge insects and will not get burnt or get rotten. Because of their flexibility, they also do not need strong or stable timber supports. If their zinc coating gets damaged, they must be painted with an anti-corrosive paint and even then, will rust after some time.
Laying of iron sheets has to start at the lowest part of the roof and each row must be completed before starting the next row. There must be an overlap of one or 1.5 corrugations at the sides and 150 mm at the ends to ensure a tight roof. The sheets can be fixed through the crown of the corrugation with galvanized nails and washers. The slope of the iron sheet roof should not be less than 1:10 or 6°.

To ensure better climatic conditions, an iron sheet roof can be painted white on the outside surfaces, or covered by a layer of 80% shade cloth about 500 to 1,000 mm above the sheets.

6.5.3 Asbestos sheets

Asbestos roof sheets are more expensive than iron sheets, as their transport costs are higher due to their weight and breakage possibility. They, however, have much better insulation qualities than iron and do not burn, rot or rust. The roof construction for asbestos sheets must be stronger than for thatch and iron for they are heavier.

Laying of asbestos sheets start with the sheets laid from the lowest part of the roof first. The end overlaps should be 100 to 150 mm and the side overlaps 1.5 corrugations. The sheets can be fixed with galvanized screws, curved washers and lead washers. The slope must not be less than 1:10 or 6°. To prevent breakage these sheets have to be handled with care.

6.6 Doors

Local carpenters can make doors on site from sawn timber, iron sheets on a frame or any suitable material. It is essential that the door be fitted tightly to prevent rodents and snakes from coming into the house. They should get support from hinges (Fig. 6.12).

6.7 Wire mesh

The wire mesh that is used for the top section of the building should have holes of about 13 mm to 25 mm, which is small enough to keep out unwanted animals. If a thatched roof is used, then the mesh should be placed under the thatch to prevent unwanted animals in the house. If there is a brick wall, then it is best to place V-shaped soft wire, of 200 mm length, in the last layer of bricks with which to fasten the mesh. Otherwise, a beam can be placed on the lower wall and the mesh fastened onto this with staplers or nails. The mesh is also fastened onto the upper beam with staplers or nails.

The height of the upper wall (mesh section) on the house must be adapted to the climate. In warmer climates it should form the major part of the wall, about 1,200 mm. For colder climates the mesh section should be narrower. Fig. 6.13 shows the fastening of wire mesh with the stapler method.
Beam
Planks to fill the space over the door. The door must be rather low to avoid sticking in the overhang

Column
Litter retaining plank
Floor

Brace
Door frame
Hinge
Wire netting

Fig. 6.12: Construction of a chicken house door
6.8 Maintenance of buildings

Maintenance actions on chicken houses are shown in Fig. 6.14.

Fig. 6.13: The fastening of wire mesh with the stapler method

Use folded "Stapler" and place one under each brick.

Net fastened with the stapler method.

Fig. 6.14: Maintenance of the building

- Repair or replace roof covering if it is leaking
- Clean house thoroughly
- Check poles for termites
- Repair cracks in plaster and walls
- Pour termite treatment around the poles every second year
- Check walls for damage from pecking
- Repair cracks in floor
CHAPTER 7

RECORD KEEPING

Without a clear record system, no business will be successful. The system has to be well organised in order to find information from it as quick as possible. Types of records that have to be kept are financial as well as production records.

The following points are of value to ensure that the system works well:

- One person must have the responsibility for the records
- Keep all records in one place
- Start a filing system for invoices, receipts, cash slips and letters
- Write the records every day and calculate the totals every month
- Use a scale to weigh the feed before feeding

Keep records on:

- Cost of feed, chickens and any other expenses
- Income from meat and eggs
- All sales and purchases made should be recorded in a cash book
- Number of eggs laid and weight of meat sold
- Number of birds in the flock
- Amount of feed given to birds over a certain period of time

7.1 Cash book

Table 7.1 shows an example of cash book lay-out.

<table>
<thead>
<tr>
<th>Date</th>
<th>Item Description</th>
<th>Amount</th>
<th>Date</th>
<th>Item Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>20/06/1995</td>
<td>300 eggs @ R5,00/doz.</td>
<td>R125,00</td>
<td>18/05/1996</td>
<td>250 kg layers mash</td>
<td>R423,00</td>
</tr>
<tr>
<td>16/08/1995</td>
<td>25 hens @ R15,00 each</td>
<td>R375,00</td>
<td>06/07/1996</td>
<td>100 kg chicken mash</td>
<td>R142,50</td>
</tr>
<tr>
<td>10/10/1995</td>
<td>500 broilers @ R18,00 each</td>
<td>R9 000,00</td>
<td>25/07/1996</td>
<td>1 roll of chicken wire</td>
<td>R67,50</td>
</tr>
</tbody>
</table>

7.2 Production records for broilers

The following information on day-old chickens is necessary for record keeping:

- Breed of chickens
- Supplier
- Number of chickens delivered and date of arrival
- Age of breeding flock
- Medicine given at breeding station

Records of the following have to be kept during the period of raising broilers:

- Daily mortalities
- Amount of feed eaten per day by a certain number of chickens
- Test mass of the flock, to be done every seven days
- Daily minimum and maximum temperatures
- Medication given
At the end of the growing period, the following have to be calculated from the record sheets:

- Total mass of meat produced
- Average living mass of the birds
- Biomass - income (Rand) per m² covered floor area. That is to give an indication on the amount of income against capital cost spend for construction of the building.
- Total mortalities
- Feed ratio. Calculated by dividing the total amount feed used (kg) by the total mass of meat to be sold (kg).

Table 7.2 shows an example of the lay-out of a typical record keeping sheet for broilers.

7.3 Production records for layers

As layers are kept for a long time, there is one record for each month and for each group.

At the top of the record sheet is all the information on the flocks' group and run number, number of hens, hatching date, breed, supplier, number of birds per square metre area, year and month.

Each day records are kept on the following:

- Amount of eggs collected.
- Amount of eggs broken.
- Number of birds alive.
- Number of birds dead.
- Number of birds culled or sold.
- Weight of feed consumed.
- Any remarks on the flock or production.

The profit of the group of birds has to be calculated. Remember that this does not include other expenses such as building cost, repairs, salaries, transport and medicine.

Table 7.3 shows the lay-out of a record sheet for layers.
### Table 7.2: Record sheet for broilers

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<tr>
<th>Age (days)</th>
<th>Dead daily</th>
<th>Dead Cumm.</th>
<th>% Dead Cumm.</th>
<th>Average mass (kg)</th>
<th>Type of feed</th>
<th>Amount of feed (kg)</th>
<th>Temperature</th>
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<tr>
<td>0</td>
<td>5</td>
<td>5</td>
<td>1%</td>
<td>0,105</td>
<td>Starter mash</td>
<td>27</td>
<td>27</td>
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<tr>
<td>1</td>
<td>2</td>
<td>7</td>
<td>1,4%</td>
<td>0,106</td>
<td>Starter mash</td>
<td>27</td>
<td>28</td>
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<tr>
<td>2</td>
<td>0</td>
<td>7</td>
<td>1,4%</td>
<td>0,110</td>
<td>Starter mash</td>
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<td>2,2%</td>
<td>0,115</td>
<td>Starter mash</td>
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<tr>
<td>Total</td>
<td>-</td>
<td>47</td>
<td>9,4%</td>
<td>1,85 kg</td>
<td>-</td>
<td>2 250 kg</td>
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</table>
Information from record sheet:

Number of birds alive : 453
Average weight of birds : 1,85 kg
Total mass of meat produced : 1,85 kg × 453 birds = 838 kg
Biomass : 838 kg / 50 m² = 16,8 kg/m²
Feed ratio : 2250 kg / 838 kg = 2,7:1

Table 7.2: Record sheet for broilers

<table>
<thead>
<tr>
<th>Day</th>
<th>Eggs laid</th>
<th>Eggs broken</th>
<th>No. of birds</th>
<th>No. dead</th>
<th>Culls/sales</th>
<th>Chick feed (kg)</th>
<th>Grow feed (kg)</th>
<th>Layer feed (kg)</th>
<th>Remarks</th>
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<tbody>
<tr>
<td>1</td>
<td>160</td>
<td>2</td>
<td>200</td>
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<td>-</td>
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<td>-</td>
<td>24 Escaped, killed by cat.</td>
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<td>24 Sick</td>
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<tr>
<td>Total</td>
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<td>194</td>
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<td>1</td>
<td>0</td>
<td>0</td>
<td>744</td>
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</tr>
</tbody>
</table>

Average eggs laid : 4 668 / 194 = 24,1 eggs/bird
Feed consumption : Layers' mash 744kg / 194 birds = 3,8 kg/bird
Feed/egg ratio : 744kg / 4 668 eggs = 160 g feed/egg laid
REFERENCES


<table>
<thead>
<tr>
<th>Company</th>
<th>Telephone</th>
<th>Fax</th>
<th>Address</th>
<th>Products / Services</th>
</tr>
</thead>
<tbody>
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<td>Agrelek (Eskom)</td>
<td>(05214) 2177</td>
<td>(05214) 2226</td>
<td>P O Box 27, Glen 9360</td>
<td>Electrical heating systems</td>
</tr>
<tr>
<td>Agro Industrial Products (Pty) Ltd.</td>
<td>(011) 769 1318</td>
<td>(011) 762 4813</td>
<td>P O Box 1749, Krugersdorp 1740</td>
<td>Drinking, feeding, heating and ventilation systems</td>
</tr>
<tr>
<td>Big Dutchman SA (Pty) Ltd.</td>
<td>(011) 452 1154 (021) 975 1565</td>
<td>(011) 609 4908 (021) 96 9333</td>
<td>P O Box 276, Edenvale 1610 P O Box 1176, Durbanville 7550</td>
<td>Laying battery systems, feeding, drinking, flooring and heating systems, egg handling equipment</td>
</tr>
<tr>
<td>Buckeye Poultry Equipment (Pty) Ltd.</td>
<td>(011) 769 1318</td>
<td>(011) 769 1318</td>
<td>P O Box 1749, Krugersdorp 1740</td>
<td>Incubators, heating systems</td>
</tr>
<tr>
<td>Chicken Shack Agencies CC</td>
<td>(012) 669 0164</td>
<td>(012) 669 0297</td>
<td>P O Box 39311, Bramley 2018 P O Box 27127, Chempet 7442</td>
<td>Feeding, drinking and heating systems, laying nests, curtains</td>
</tr>
<tr>
<td>Control Chemicals (Pty) Ltd.</td>
<td>(011) 786 7166 (021) 52 1080</td>
<td>(011) 885 1300 (021) 52 3354</td>
<td>P O Box 258, Laezonia 0026</td>
<td>Klorman water purifier</td>
</tr>
<tr>
<td>Custom Moulders (Pty) Ltd.</td>
<td>(011) 865 2023</td>
<td>(011) 865 1722</td>
<td>P O Box 16289, Leondale 1424</td>
<td>Feeding, drinking and heating systems, egg holders</td>
</tr>
<tr>
<td>Dynamic Automation CC</td>
<td>(0325) 62071 (011) 957 3219</td>
<td>(0325) 62201 (011) 957 3221</td>
<td>P O Box 99, Hammersdale 3700 P O Box 368, Muldersdrif 1747</td>
<td>Feeding, drinking and heating systems, nests, egg handling equipment, ventilation systems, curtains, manure handling equipment</td>
</tr>
<tr>
<td>FJ Horn Poultry CC</td>
<td>(011) 659 0767</td>
<td>(011) 659 0767</td>
<td>P O Box 293, Muldersdrif 1747</td>
<td>Slaughter and abattoir equipment</td>
</tr>
<tr>
<td>Glamfin Products (Pty) Ltd.</td>
<td>(011) 793 1368</td>
<td>(011) 792 9400</td>
<td>P O Box 72131, Parkview 2122</td>
<td>Sundew carcass digestion equipment</td>
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<tr>
<td>GSI / Cumberland SA (Pty) Ltd.</td>
<td>(011) 794 4455</td>
<td>(011) 794 4515</td>
<td>P O Box 786, Fourways 2055</td>
<td>Feeding systems</td>
</tr>
<tr>
<td>JF Equipment Machinery CC</td>
<td>(011) 760 3494 (0331) 43 4287</td>
<td>(011) 760 3492 (0331) 43 4282</td>
<td>P O Box 5082, Weltevredenpark 1715 P O Box 945, Hilton 3245</td>
<td>Abattoir equipment</td>
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<tr>
<td>Jarvis Products Corporation (Pty) Ltd.</td>
<td>(011) 974 6776</td>
<td>(011) 974 6802</td>
<td>P O Box 9581, Eden Glen 1613</td>
<td>Abattoir equipment</td>
</tr>
<tr>
<td>John F. Marshall (Pty) Ltd.</td>
<td>(011) 493 2821</td>
<td>(011) 493 5957</td>
<td>P O Box 39530, Booyenssens 2016</td>
<td>Drinking and heating systems, curtains, incubators</td>
</tr>
<tr>
<td>Linco Food SA CC</td>
<td>(011) 760 3494</td>
<td>(011) 760 3494</td>
<td>P O Box 5082, Weltevredenpark 1715</td>
<td>Slaughter and abattoir equipment</td>
</tr>
<tr>
<td>Meyn SA (Pty) Ltd.</td>
<td>(011) 708 3603</td>
<td>(011) 708 3620</td>
<td>P O Box 1012, Honeydew 2040</td>
<td>Abattoir equipment, capture systems</td>
</tr>
<tr>
<td>Midrand Poultry Supplies (Pty) Ltd.</td>
<td>(011) 318 2239 (0331) 76233</td>
<td>(011) 318 2272 (0331) 76240</td>
<td>P O Box 138, Halfway House 1685 P O Box 3047, Pietermaritzburg 3200</td>
<td>Feeding and drinking systems, scales, laying batteries, nests, incubators</td>
</tr>
<tr>
<td>Modern Poultry Methods CC</td>
<td>(021) 975 1565</td>
<td>(021) 969 333</td>
<td>P O Box 1176, Durbanville 7550</td>
<td>Agents for “Big Dutchman” equipment</td>
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<tr>
<td>Company</td>
<td>Telephone</td>
<td>Fax</td>
<td>Address</td>
<td>Products / Services</td>
</tr>
<tr>
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<tr>
<td>Movosa (Pty) Ltd.</td>
<td>(011) 769 1318</td>
<td>(011) 762 4813</td>
<td>P O Box 1749, Krugersdorp 1740</td>
<td>Egg handling equipment, packaging of poultry</td>
</tr>
<tr>
<td>NatureForm Hatchery Systems</td>
<td>(0446) 93 3187</td>
<td>(0446) 93 3187</td>
<td>P O Box 2131, Mosselbaai 6500</td>
<td>Incubators</td>
</tr>
<tr>
<td>Rehobot Engineering</td>
<td>(014) 549 2871</td>
<td>(014) 549 2871</td>
<td>P O Box 87, Koster 0348</td>
<td>Scrapers for manure</td>
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<tr>
<td>Reliance Poultry Equipment CC</td>
<td>(011) 794 4455</td>
<td>(011) 794 4515</td>
<td>P O Box 2495, Honeydew 2040</td>
<td>Feeding systems, scales, laying batteries, abattoir equipment</td>
</tr>
<tr>
<td>Spartan Equipment</td>
<td>(011) 318 2239 (0331) 76233</td>
<td>(011) 318 2272 (0331) 76240</td>
<td>P O Box 138, Halfway House 1685 P O Box 3047, Pietermaritzburg 3200</td>
<td>Feeding and drinking systems, scales, laying batteries, nests, incubators</td>
</tr>
<tr>
<td>Starlec Engineering CC</td>
<td>(011) 768 6021</td>
<td>(011) 768 6025</td>
<td>P O Box 7752, Westgate 1734</td>
<td>Feeding and drinking systems, heaters, slaughter equipment</td>
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<tr>
<td>Thermacon Suppliers (Pty) Ltd.</td>
<td>(011) 792 4494</td>
<td>(011) 792 4536</td>
<td>P O Box 651, Fontainebleau 2032</td>
<td>Heating systems</td>
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<tr>
<td>Vegtech (Pty) Ltd.</td>
<td>(021) 862 0985</td>
<td>(021) 862 7618</td>
<td>P O Box 9082, Klein-Drakenstein 7628</td>
<td>Gas heating systems</td>
</tr>
<tr>
<td>Vicro Bulk (Pty) Ltd.</td>
<td>(016) 455 2040</td>
<td>(016) 455 3309</td>
<td>P O Box 673, Vereeniging 1930</td>
<td>Feeding systems</td>
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<tr>
<td>Vine Vet (Pty) Ltd.</td>
<td>(011) 792 1212</td>
<td>(011) 792 3073</td>
<td>P O Box 563, Paulshof 2056</td>
<td>Jamesway incubators</td>
</tr>
<tr>
<td>Vosmar Incubators CC</td>
<td>(012) 663 6748</td>
<td>(012) 663 6789</td>
<td>P O Box 9692, Centurion 0046</td>
<td>Incubators</td>
</tr>
<tr>
<td>Vyna Tarps CC</td>
<td>(015) 293 2778</td>
<td>(015) 293 0057</td>
<td>P O Box 55782, Pietersburg 0700</td>
<td>Plastic curtains</td>
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