As opposed to natural methods where the hen sits on the eggs, commercial hatcheries customarily rely on artificial incubators. Chicken hatchery business is more than the ordinary raising of chicken. It basically entails the regular production and supply of day old chicks by artificial incubation.

There can be variations in the nature of the hatcheries such that it may be part of a breeding farm, an arrangement where day old chicks and parent stocks are produced or where the breeding stock is not maintained but eggs are purchased to produce day old chicks.

A vibrant parent stork that supplies the eggs for hatching has to be maintained if eggs are not going to be purchased. Young chicks that are not going to be sold must be considered as well as adult chicken that go broody. Other poultry species such as ducks, turkeys, guinea fowl, quails and pigeons can also be integrated into the hatchery.

**Planning the hatchery**

**Licence**

You will need a licence to operate a hatchery. This licence can be obtained from the Veterinary Department. It is issued after the department is satisfied that the premises meet all phytosanitary requirements and do not expose humans and the environment to pollution and health hazards. Although this project does not fall within the control of the National Environmental Management Authority (NEMA) it will be important to have a good environmental management plan to ensure that the waste produced from the hatcheries does not affect the local population.

**Scale of operation**

The turnover rate should be the basic concern because it determines the finances required to set up and run the business. The size of the perceived poultry market, whether local, external or a combination is a good indicator on the size of the hatchery to be set up. For the local market you need to
investigate the following in order to determine the demand and therefore the appropriate size of the hatchery:

1. The local chicken or poultry population
2. The number of chicken or poultry farms within the locality
3. Chicken or poultry varieties
4. Number of chicks produced per month
5. Required number of eggs to produce the chicks
6. The number of batches and number of eggs hatching each batch
7. The size of incubators and hatching house area

**Site selection**

You need to look for the following when selecting a site for the hatchery:

1. A ground that is well drained and preferably a high ground
2. Good infrastructure such as roads for transportation, electricity and water system
3. Peaceful and clean environment with plenty of fresh air. Polluting environments such as heavy traffic, slaughter houses, poultry keeping farms, mining areas, chemical plants can affect the embryo. Check that the prevailing winds do not carry poultry debris from other farms into the hatchery.
4. The building should be located at least 150m away from the nearest poultry house and should have its own entrance and exit separate from the parent stock house.

**Housing**

The design and construction must take into account the sanitation, control of temperature, humidity and diseases. Use appropriate building materials to prevent leaks and draughts. The floor should be flat, smooth and easy to clean and the height from floor to ceiling should be about 3.4 to 3.8m. Because of the necessity for regular washing and disinfection the inside walls should be covered by hard non-absorbent finish and tiles are preferred.
In order to minimize the risk of disease transmission between eggs and chicks, arrange the personnel and egg flow such that there is minimum or no back tracking by staff. Separate the personnel who work in the hatchery from those working in the breeder farm.

The building should provide rooms for

1. Holding eggs prior to setting
2. Grading and traying of eggs
3. Incubation and hatching machines
4. Chick sexing
5. Grading and holding prior to sales
6. Additional rooms for cleaning of equipment, fumigation and washing of staff

**A simple hatchery layout**

![Simple Hatchery Layout Diagram]

**Required equipment**

1. Incubators
2. Egg setting equipment
3. Egg transfer equipment
4. Chick handling and washing equipment
5. Climate control equipment

**Heating**
Where the heating system uses electricity it is important to install a standby generator in cases of power failure. Power failure causes failure of temperature and humidity system.

**Breeding**

Place a cock for every 10 hens in a separate building. Provide laying nests and other equipment necessary for production.

**Health**

Poultry operations pose high risks of disease transmissions which at times can become epidemics of high proportions. Health and sanitary precautions must therefore be strictly adhered to. You must design and implement an effective and comprehensive health and safety programs that comply with international standards. The following sanitary procedures are recommended:

1. Ensure that eggs for hatching are free from diseases if they have to be purchased.
2. Fumigate all purchased eggs immediately
3. Wash and disinfect all setting and hatching trays, the incubator and hatcher rooms, and all rooms in the hatchery after every hatch.
4. Dispose hatchery debris by burning in specially constructed facilities or burying deeply.
5. Attendants and visitors must be clean and disinfected before proceeding into the hatchery.

**Records**

Other than for your own business, it is a requirement that the following records are properly kept.

1. Name and address of flock owner of all eggs received
2. Number of eggs and date received
3. The number of all hatching eggs and date received
4. The number of all baby chicks sold and flock origin,
5. Date, name and address of purchaser
6. Flock inspection and test results

Hatchery operations

Incubation

1. Store eggs in plastic egg trays at room temperature and 75% relative humidity.
2. Do not store eggs for long before setting because they lose moisture through evaporation and therefore hatchability.
3. Line egg cases with plastic to prevent evaporation if eggs must stay long before setting.
4. Attach a record card to indicate the source of eggs, type and date of setting.
5. If the eggs are dirty they should be cleaned by washing in hot water with disinfectants such as Dettol. However, washing increases the chances of infection and should be discouraged. Alternatively, they should be fumigated prior to setting using formaldehyde.
6. Warm the eggs to room temperature 6 hours before setting.
7. Sort and grade the eggs before placing them in the incubator. Remove all broken, oversized, undersized or shapeless eggs.
8. Place the eggs in clean trays and warm them to 37.5°C.
9. Warm the incubator to 36.5 – 37.5°C then carefully arrange the eggs in hatching trays. Set the eggs at an angle of 45° with the narrow end pointing down.
10. Maintain humidity at 70 – 80%.
11. Read the thermometer every 6 – 8 hours and adjust the heat accordingly whenever the thermometer reading falls below 36.5°C or rises above 37.5°C.
12. Turn the eggs every 6 – 8 hours and continue doing this up to day 18.
13. Check the temperature every time you turn the eggs and adjust the heat accordingly.
14. Candle the eggs on day 7 and 14 to ensure you don’t have infertile or those eggs with dead embryos.
15. Remove and dispose of all broken, infertile and spoilt eggs.
16. On day 19 transfer eggs from the incubator to the hatcher.
17. Increase moisture to soften the eggs and help the chicks emerge.
18. Chicks start to come out on day 20. Do not keep for long chicks that hatch early. Remove them from the hatcher and process them so that they can be delivered within 12 hours.
19. Most of the chicks will have hatched on day 21.
20. Chicks dry within 30 – 45 minutes after they come out from their shells. Remove them immediately from the incubator after they are dry to prevent them from overheating.
21. The day old chicks are now ready for sale or brooding.
22. Remove the egg shells, dead chicks and spoilt eggs from the hatching trays then clean and disinfect the incubator for the next batch of eggs.

Handling chicks

Packing

1. Assemble the chick boxes before pulling the chicks from the hatchers.
2. Pull out the trays one at a time
3. Remove and count the healthy chicks as they are placed into the chick boxes.
4. Leave the poor quality chicks in the trays and dispose them off with empty shells, unhatched eggs and hatchery debris.
5. Allow the chicks to stand in the chick boxes for 4 – 5 hours to let them harden.
6. Keep a record of total saleable chicks and hatches each day

Sexing

1. Separate the cockerels and pullets at hatching time.
2. Sexing can be done in three ways i.e. color, feather or vent sexing.

Vaccination

1. Vaccinate against Marek’s Disease and New Castle Disease on day one.
Debeaking

1. If the chicks are meant for broilers debeak them on day one.
2. Debeaking can be done by cold method through a cold knife or scissors by the hot method through a debeaking machine with a hot blade.

Transportation

1. Transfer chicks ready for delivery into chick holding rooms.
2. Record the breed, fertility, hatchability, number of saleable chicks, percent hatch and culls before the chicks leave the hatchery.
3. Give customers adequate information about breed, expected performance and vaccination record of chicks they purchase in a small written guide
Gross margin for 500 commercial layers

Some people have requested for gross margin of raising 500 commercial layers. Here is a breakdown of the expenses and returns that are expected. The prices are not uniform throughout the country therefore you are advised to adjust the prices according to your locality.

Important assumptions

- 500 birds flock
- 12 months production period
- Eggs
- Production of eggs start when birds are 6 months old
- 10% mortality (50 birds)
- 90% laying percentage
- 10% egg losses
- Cost of 1 DOC at Kshs 95 each
- Building already exist

Day old chicks

500 chicks @ 95 each = Kshs 47,500.00

Brooding costs

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Quantity</th>
<th>Unit price</th>
<th>Total Amount (Kshs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardboards</td>
<td>Pieces</td>
<td>15</td>
<td>450</td>
<td>6,750.00</td>
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<tr>
<td>Paraffin</td>
<td>Litres</td>
<td>60</td>
<td>110</td>
<td>6,600.00</td>
</tr>
<tr>
<td>Kerosene lamps</td>
<td>No</td>
<td>10</td>
<td>900</td>
<td>9,000.00</td>
</tr>
<tr>
<td>Age (weeks)</td>
<td>Feed type</td>
<td>Amount (70kg bags)</td>
<td>Cost (Kshs)</td>
<td>Total (Kshs)</td>
</tr>
<tr>
<td>------------</td>
<td>---------------------</td>
<td>--------------------</td>
<td>-------------</td>
<td>--------------</td>
</tr>
<tr>
<td>0 – 8</td>
<td>Chick and duck mash</td>
<td>10</td>
<td>3300</td>
<td>33,000.00</td>
</tr>
<tr>
<td>8 – 20</td>
<td>Growers mash</td>
<td>50</td>
<td>2400</td>
<td>120,000.00</td>
</tr>
<tr>
<td>20 - 75</td>
<td>Layers mash</td>
<td>255</td>
<td>2550</td>
<td>650,000.00</td>
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<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>803,250.00</strong></td>
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</table>

### Equipment

<table>
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<td>500</td>
<td>7500.00</td>
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<td>Round drinkers</td>
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<td><strong>Total</strong></td>
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<tr>
<td>Treatment</td>
<td>Frequency</td>
<td>Unit price (Kshs)</td>
<td>Total Amount (Kshs)</td>
</tr>
<tr>
<td>----------------------</td>
<td>-----------</td>
<td>-------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Gumboro vaccination</td>
<td>2</td>
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<td>1000.00</td>
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<td>NCD vaccination</td>
<td>3</td>
<td>500</td>
<td>1500.00</td>
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<td>Fowl pox</td>
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<td>500.00</td>
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<tr>
<td>Assorted antibiotics</td>
<td></td>
<td></td>
<td>2000.00</td>
</tr>
<tr>
<td>Dewormers</td>
<td></td>
<td></td>
<td>1000.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>6000.00</strong></td>
</tr>
</tbody>
</table>

**Labour**

1 attendant for 18 months @ 4000 each = 72,000.00

**Summary of cost**

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<thead>
<tr>
<th>Item</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>Brooding</td>
<td>9,000.00</td>
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<tr>
<td>Day old chicks</td>
<td>47,500.00</td>
</tr>
<tr>
<td>Feeds</td>
<td>803,250.00</td>
</tr>
<tr>
<td>Equipment</td>
<td>13,300.00</td>
</tr>
<tr>
<td>Veterinary</td>
<td>6000.00</td>
</tr>
<tr>
<td>Labour</td>
<td>72,000.00</td>
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</table>
Returns

<table>
<thead>
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<th>Item</th>
<th>Unit</th>
<th>Quantity</th>
<th>Unit price</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eggs</td>
<td>Trays</td>
<td>4300</td>
<td>300</td>
<td>1,290,000.00</td>
</tr>
<tr>
<td>Culls</td>
<td>No</td>
<td>400</td>
<td>300</td>
<td>120,000.00</td>
</tr>
<tr>
<td>Gunny bags</td>
<td>No</td>
<td>315</td>
<td>30</td>
<td>9,450.00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>1,419,450</strong></td>
</tr>
</tbody>
</table>

Gross margin

Kshs \(1,419,450 - 951,050\) = Kshs 468,400.00

You can increase the profit margin by cutting costs and increasing the laying percentage.

######################################################################## END ############################################################
How to boost the productivity of backyard chicken

Due to poor management given to local chicken, they have become adapted to free range methods of survival. The birds are able to gather enough nutrients for growth, production and reproduction but under these circumstances their yield potential is low.

The average household has about 10 chickens mainly for home consumption, and however much they try the number remains almost the same. The reason being that birds are do not get enough drinking water regularly. Another key production problem relates to the occurrence of diseases such as New Castle Disease (NCD) and coccidiosis as many farmers do not bother about controlling diseases. As a result many birds die while others are lost through predators. An equally important problem is shelter for the birds where farmers live with the chicken in their houses and release them to scavenge during the day. On average a farmer loses between 15 – 40% of the stock annually due to these problems which they can easily control.

Local hens lay a batch of 10 – 12 eggs then they become broody and sit on the eggs. This is repeated 3 to 4 times a year. Egg hatchability varies from 80 – 90%. The chicks hatched are not cared for and only about 2 – 3% reaches maturity. Under these conditions the annual output of a flock of 10 chickens can be estimated roughly at 200 eggs and about 17kg of meat. This performance can be tremendously improved by applying just simple management practices.

The local chicken can produce more eggs and young chicks if the farmer takes better care of them. The extra effort and some little spending have always proved to be profitable.

Feeding

A few handful of maize or other available grains and a place to drink are essential for extra production of eggs and meat. Eggs and meat do not come from thin air, they come from the edible feed materials the birds are
scavenging. So when they eat more and better feed, the number of eggs increases. A kilogram of maize is cheaper than a kilogram of eggs or meat and so a few handfuls a day is clearly profitable.

**Housing**

Chickens are like children who need to be protected, to be sheltered and to be fed. They need a clean well ventilated place to roost with laying nests and clean litter. The shelter should be closed at night to protect the birds from wild animals. If a hen has a protected place to go to, eggs and day old chicks are not lost in the bush. There must be laying nests, one for every 5 birds. Carton boxes will do provided they are always clean with litter on the bottom.

**Suppression of broodiness**

The next step to increase egg production is to suppress broodiness. Broodiness is in fact the main cause of low egg production and is a feature which has been eliminated in hybrid birds by breeding and selection. Broodiness is of course essential for the farmer to increase his flock but there is usually too much of it. Nearly half the lifetime of a good laying hen is spent sitting on the eggs and brooding her chicks.

To get rid of broodiness a hen should be isolated by putting it in a small cage without litter; the cage is fixed somewhere above the rest of the flock. Feed and water should be provided. After 3 to 4 days, the broodiness will normally have disappeared. Note that this is the best way. Most local measures are much too harsh and often counterproductive. For example immersion in water or the pulling out of the vent feathers causes stress such that egg production stop completely.

**Rearing chicks**

The hatchability of local chicken is good because for every 10 – 12 eggs, 8 – 10 day old chicks appear. But what happens is that gradually in 2 – 3 weeks nearly
all of them disappear. The chicks can be kept alive by protecting and feeding
them. This means constructing or adding a day-old-chick shelter and a small
fenced-off run for chicks only and the mother hen. The chicks should be fed on
mashed maize put in a feeder where grown birds including the mother hen have
no access. In addition they should be able to scavenge in their small run as they
cannot stay alive and well on maize only.

**Vaccinations and disease control**

A good number of local chicken keepers believe that the local chicken is not
affected by some diseases such as fowl pox and fowl typhoid. But these
diseases affect the local chicken just as they do the exotic birds. It is important
not take chances with the birds because any disease often result in losses for
the poultry keeper. Even more devastating are the diseases that go unnoticed
by the farmer while they reduce vigour of the birds, the growth rates, feed
efficiency, egg production and profits.

In prevention, a good knowledge of poultry keeping and hygiene is very
important. One of the first rules of hygiene is recognizing a sick bird and
establishing an accurate diagnosis. Healthy birds are constantly active, bright
and alert whereas sick birds will stand half-asleep at the corners of the house,
with their feathers ruffled up, their heads drawn into their wings and the tail
drooping.

In poultry the main effort should be in prevention through hygiene and
management and vaccination as the damage is already done when the birds are
infected. Coccidiostats are very effective in controlling coccidiosis and should
always be available especially in rainy weather. Regular disinfection of chicken
housing is recommended to rid the pests and parasites and other disease
causing organisms.

Vaccination against the following diseases is recommended

<table>
<thead>
<tr>
<th>Type of vaccination</th>
<th>How administered</th>
<th>Suggested schedule</th>
</tr>
</thead>
</table>


<table>
<thead>
<tr>
<th>Disease</th>
<th>Treatment</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mareks disease</td>
<td>Injection</td>
<td>Day old</td>
</tr>
<tr>
<td>New castle disease</td>
<td>Intra nasal (drop)</td>
<td>At 2 or 3 weeks</td>
</tr>
<tr>
<td></td>
<td>In the eye (drop)</td>
<td>At 18 weeks and at 6 months intervals</td>
</tr>
<tr>
<td></td>
<td>Drinking water</td>
<td>Same</td>
</tr>
<tr>
<td>Fowl typhoid</td>
<td>In drinking water</td>
<td>At 8 weeks and at 6 months</td>
</tr>
<tr>
<td></td>
<td>Intramuscular</td>
<td></td>
</tr>
<tr>
<td>Fowl pox</td>
<td>Wing web method</td>
<td>At 18 weeks</td>
</tr>
</tbody>
</table>

**Predators, pests and parasites**

Not to mention that predators should always be kept at bay by constructing a safe structure for the birds. *External pests* such as lice, fleas, ticks and mites suck the blood of the birds and cause weaknesses and a drop in egg production. Disinfect the poultry house and treat the affected birds with sprays or powders. Soft ticks (kitungu) are a special problem for poultry keepers in Machakos and Kitui Counties. The best control is to build poultry house with smooth walls and apply acaricides and insecticides.

Worms causes a wide range of problems to the birds and can best be controlled by regular deworming. Drugs against worms are available and are very effective.

**Conclusion**

All the above requires the attention of the farmer because no good results can be achieved without some effort. The farmer will be rewarded for every effort put into caring for the birds. Chicken do not care for expensive material so the
cost can be very low. However they care for a good, safe and clean environment and many farmers who have put their effort on only a few of these aspects have reported very good results.
Layers Keeping Guidelines

Farm enterprise setup

Poultry keeping is a delicate enterprise and before engaging in production, it is important to have knowledge regarding husbandry aspects such as hygiene practices, disease control, vaccination program, feeding systems, housing detail and other related factors which work together to realize a profitable venture.

Information in the following areas is handy to guide on what is expected hence prepare for the challenges that may lie ahead.

**Operational costs.**

A farmer needs to know the costs to be incurred before venturing in this business.

The major costs include:

- Housing
- Essential farm facilities,
- Cost of the foundation stock,
- Feeding costs,
- Vaccination costs

Animal production in either small or large scale if not properly handled can lead to large losses due to the delicate nature of the enterprise. The owner should personally get involved in management and supervision or if the objectives are to be realized, the one who takes care should have shared interest.

**Life stages**

Every animal has developmental stages with specific requirements which a farmer should know and attend to accordingly and separately.

**Feeding Plans & Costs**

Feeding costs are single major contributor the costs of farming. Feeds should be purchased from a reputable company. The feed should be of good quality with right proportions of the
required nutrients depending on the stage of your animal. And costs such as transport may be put into consideration.

If a farmer cannot afford or if has the raw materials, with good training, he can assemble ingredients in right proportions and process them accordingly. Farmers can get trained on feed formulation in livestock production centers in their respective districts. The aim is to reduce the feed costs as much as it is practically possible and hence increase the profits.

**Housing**

The housing should be done right depending on the ecological conditions of where one is living to reflect the climate of the place. If not correctly done poor housing may lead to failure and frustrations due to high losses, frequent disease outbreak, below bar production level, overcrowding and poor ventilation.

The house should have a right height depending on the system adopted, right roofing, this means not construction of an expensive house but whichever structure built should have enough space, be well ventilated, capable on shielding birds from harsh weather conditions.

**Enterprise profitability**

**BUDGET 250 BIRDS LAYERS**

Deep litter floor system

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>QUANTITY</th>
<th>UNIT PRICE (Kshs)</th>
<th>TOTAL (Kshs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sale of egg</td>
<td>Eggs</td>
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<td>10</td>
<td>655,200</td>
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<tr>
<td>Sales cull</td>
<td>Birds</td>
<td>250</td>
<td>300</td>
<td>75,000</td>
</tr>
<tr>
<td>Sale of bags</td>
<td>Bags</td>
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<td>50</td>
<td>2,500</td>
</tr>
<tr>
<td>Item</td>
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<td>kg</td>
<td>Birds</td>
<td>Litres</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>-----</td>
<td>--------</td>
<td>-------</td>
<td>--------</td>
</tr>
<tr>
<td>Day old chicks</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chick/Duck mash</td>
<td>250</td>
<td>100</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>Growers Mash</td>
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<td>3,200</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>Layers Mash</td>
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<td>2,900</td>
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<td>100</td>
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<td>Medication</td>
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<td>Labour 18 months</td>
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<td>100</td>
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<tr>
<td><strong>Total cost</strong></td>
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</tr>
<tr>
<td><strong>Gross Margin</strong></td>
<td></td>
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</tr>
</tbody>
</table>
Fixed Capital – Ksh. 150,000

Recovery Period – 10 years

Interest rate – 20%

Annual Capital Cost – Ksh150,000 x CRF

- Ksh 150,000 x 0.2385
- Ksh.35,775

Total Variable Cost Ksh.392,780+ 58,917+35,775=Ksh.487,472

Expected Net Income – Ksh.772,700– 487,472

- Ksh 285,228

Break Even Price/egg = 7.44

Remarks

When family labour is used Net income will Improve

1. 12 months productivity period has been adopted
2. Eggs/bird to be 255 per year
3. Laying percentage to be 70%
4. Chick and Growers mortality rates to be 5%
5. Layers mortality to be 1%
6. Fowl pox vaccinate at 10-12 weeks once.
7. Fowl-typhoid – vaccinate at 6-8 weeks once
8. New Castle – vaccinate 1 week – 2-3 weeks, 8-10 weeks and every 2-3 months.
9. Infectious bronchitis – 1 week, 2-3 weeks
10. Gumboro – 1-2 weeks, 3-4 weeks
11. NCD + IB + 1BD (killed) – 18 – 20 week
12. Profitability will be realized After 2 years holding other factors of production constant
All about brooding chicks

Brooding chicks is an important aspect of a poultry enterprise that many poultry farmers often ignore. High chick death rates that are often reported are normally preventable. The main aim of brooding chicks is to reduce such deaths and run the venture efficiently and economically. The only trick is to provide a comfortable

and healthy environment for the growing birds. Failure to provide such an environment often results in decreased growth and development, poorer feed conversion, increased incidences of diseases and deaths which ultimately translate into diminished profits or complete losses.

Among the critical factors to consider are temperature, air quality, humidity and light. These will dictate the housing design for the chicks. Other factors are feeding, watering and disease control.

Temperature

The body temperature of a day-old chick is approximately 39°C, but by the fifth day of age the body temperature rises to 41.1°C, which is the normal body temperature of an adult bird. Chicks require heat from the time they are hatched until they are six weeks old because they cannot maintain their body temperature without an external source. The ability to regulate body temperature is acquired around 12 to 14 days of age.
While chicks are more tolerant to high temperatures than adult birds, high temperatures for extended periods of time increase mortality and have negative impact on performance. Chicks that are subjected to cold temperature have impaired immune and digestive systems which result in reduced growth and increased susceptibility to diseases.

Warm the brooding area before the chicks arrive. Chicks can be easily stressed if their body temperature decreases or increases by as much as one degree. During the first week temperatures should be 32°C to 35°C then reduced by 2.5°C per week until room temperature is reached. The actions of the chicks can be a guide in temperature control. Read how to control temperature in a brooder.

Floor temperatures are also crucial. The average floor temperatures should be 32°C on the day that chicks are placed in the house.

**Ventilation**

Good ventilation is required to control temperature and get rid of carbon dioxide, ammonia, other gases, moisture, dust and odors. Air entering the brooding house should be warmed up to brooding temperature before coming
into contact with the chicks to prevent chilling. This also increases moisture holding capacity thereby helping to maintain litter conditions in the house.

In large brooding houses fans should be used to break up temperature stratification and provide a more uniform temperature throughout the poultry house.

**Humidity**

The level of humidity influences the ability of the bird to cool itself through panting and influences ammonia production. Relative humidity should be maintained between 50 and 70 percent during the brooding period. Dusty conditions in the poultry house are associated with relative humidity below 50 percent. If relative humidity increases above 70 percent ammonia from the birds fecal material accumulates and has a negative impact on bird health and performance. High ammonia levels impair the immune system, increases respiratory diseases and reduces growth rate which is never gained back.

**Lighting**

The main purpose of lighting during brooding is to ensure that chicks are active and seek out food and water sources. Chick activity is higher in bright than in low light intensity. Bright lights assist chicks to locate feed and water and this is usually accomplished by 7 to 10 days of age. Thereafter the light intensity and duration should be reduced to a minimum of 25 lux (2.5 foot candles) or more at bird level. Normally lights are initially allowed 23 hours a day at maximum intensity. Then the intensity is reduced when chicks are 7 to 10 days of age and by 10 to 14 days it should be at 5 lux (0.5 foot candles).

**Housing**

Inside a local brooding house
Some people brood their chicks in their homes but this is not recommended. Brooders present a certain amount of fire risk so a high degree of precaution should be taken when deciding its location and design.

Brooder houses generally have litter floors, preferably with a layer of wood shavings at least four inches thick. Brooders with wire floors and a droppings pan underneath can also be used but they smell worse than the other kinds of brooders.

The brooding house should be clean, dry and comfortable with adequate heat and space. The equipment should be clean and in good condition. The location should be draft-free with good air circulation, access to clean water and be well protected.

A brooder house measuring 10 by 12 feet accommodates 120 chicks to the age of eight weeks. Chick guard rings should be 12 inches high arranged in a circle 6 feet in diameter around the brooder stove. Feeders are placed in a spoke-like arrangement radiating outward from underneath the outer portion of the brooder canopy. This provides chicks access to feed and allows them to move freely in and out from the heat source.

<table>
<thead>
<tr>
<th>Age of chicks</th>
<th>Floor space per bird</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 4 weeks</td>
<td>1/2 square foot</td>
</tr>
<tr>
<td>4 to 8 weeks</td>
<td>1 square foot</td>
</tr>
</tbody>
</table>

**Water**

Chicks should have warm water available right way. Waterers should be placed on a block to keep the water free from litter. Replace the water twice a day, or more frequently if necessary to keep the water clean and fresh. Clean the waterer each time you make the change, and refill it with lukewarm water.
The amount of waterer space recommended for 100 brooding chicks is:

<table>
<thead>
<tr>
<th>Age of chicks</th>
<th>Waterer space</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 1 week</td>
<td>Six 1-quart jar waterers</td>
</tr>
<tr>
<td>1 to 4 weeks</td>
<td>Two 2-gallon waterers</td>
</tr>
<tr>
<td>4 to 12 weeks</td>
<td>Two 5-gallon waterers</td>
</tr>
</tbody>
</table>

Automatic waterers may be used after the first week. Many types of waterers are available from local agrovets. Note that in the first few days chicks can get soaked in waterers with wide bowls and may die of chilling. So use small waterers at first and gradually replace with regular ones.

**Feeding**

Provide feed and water as soon as the chicks are transferred to the brooder. If possible the chicks should be fed about three hours after being introduced into the brooder. Also they tend to be dehydrated and it is important that they drink the water first before they eat.

Give the first feed on flat surfaces at ground level. One square foot per 50 chicks is a good spacing. Set up the regular feeders and fill them right from the beginning.

Rapidly growing chicks should have a well-balanced starter diet for proper growth and development. For the first two days, it is a good idea to feed the chicks on cracked maize grains to reduce the problem of dried feces attaching on the rear. Thereafter replace the cracked maize grains with a chick starter mash. This can be done by feeding grain in the first feeders and chick starter in the regular feeders.

The feeder space recommended for 100 chicks is:

<table>
<thead>
<tr>
<th>Age of chicks</th>
<th>Feeder space</th>
</tr>
</thead>
</table>


<table>
<thead>
<tr>
<th>Time Period</th>
<th>Number of Feeders</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 4 weeks</td>
<td>12 linear feet or two 3-foot feeders</td>
</tr>
<tr>
<td>4 to 8 weeks</td>
<td>20 linear feet or two 5-foot feeders</td>
</tr>
</tbody>
</table>

**Types of Brooders**

Some types of brooders heat the entire room or house. Other types warm the area under or near the hover, while the rest of the room remains relatively cool. The most popular brooders are infrared heat lamps, propane gas brooders and propane catalytic brooders. Convenience, installation cost and operating cost will determine the choice.

The infrared heat lamp (Pyrex-type) is ideal for brooding small lots of 200 chicks or less. One 250-watt lamp is provided for each 50 to 75 chicks. During normal weather, infrared heat lamps placed 1 to 1.5 feet above the chicks will usually provide enough heat.

Large commercial poultry operations generally use big propane brooders with a central brooder and a metal canopy or hover that retains the heat. Each brooder handles 1,000 or more chicks.

Farmers brooding fewer than 1,000 chicks at once generally use electric brooders.

**Preventing coccidiosis**

Coccidiosis can take a heavy toll on chicks, starting from about three weeks of age. Chicks raised on litter floors become infected easily and the multiplication of the bacteria can lead to dead, stunted, and sick chicks. Chicks that are exposed to only low levels of coccidia become immune without becoming sick.

A lot of people don't like the idea of using medicated feed but that is the only way of treating the disease. If you want to mix your own feed, you will need to use coccidiostats to control the disease. Almost all commercial poultry feeds contain drugs that suppress coccidia.
Treating Coccidiosis

Anti-coccidial drugs are very effective. Infected chicks should be treated immediately by putting a coccidiostat in the water. Drug substitutes such as garlic and herbs are not as effective as drugs.

The business of raising day old chicks

Raising day old chicks in Kenya has become very popular because you only need a viable batch of eggs for hatching, a reliable incubator and a working knowledge of poultry incubation. Also selling day old chicks can be done both locally and as a mail order business. Your hatchery could be just what people in your community needed as a nearby source of day old chicks.

Many people would like to raise chickens themselves, rather than to buy pullets but are unable to get or hatch enough day old chicks.

Your job would be to have enough laying hens to lay eggs, incubate them, and sell them when they hatch. Many hatcheries take pre-orders and deliver baby chicks one day after they hatch. You can also distribute the chicks to local farmers or take orders through your website. Day old chicks sell at around Kshs 80 to 100 each. The Kenbro breed is a top selling breeds that you can start with.

Using only egg incubators you can sell day-old chicks as a viable business. With hens that supply a guaranteed number of eggs you can distribute the eggs such that there are eggs for the incubator at any one time. If you organize properly,
day old chicks can be produced on a weekly basis for the market. The capital outlay is minimal, no specialized knowledge is needed and very little infrastructure is required.

This business model is ideal for small-scale farmers who want to start their own hatcheries with low capital input and high returns on investment. It is a highly profitable business to start and your capital requirement is very small.

The best way to start is by getting good chicken breeds and rearing them for laying eggs. Kenbro from Kenchic is very popular with farmers because of its high egg yield and quality meat. You are unlikely to meet the demand. Within six months your hens should be ready to give a constant supply of eggs for the incubator. Your business is to hatch the eggs and sell as day old chicks.

And an even easier way is to outsource the batch of eggs for hatching. But here you will need to be very careful and observant. The breeder you are getting the eggs from should be reliable and trustworthy because in order to successfully accomplish this venture you need to have fertile eggs that produce healthy embryo.

When choosing the eggs, don’t let the bigger ones fool you. Large eggs are not ideal eggs for hatching as they develop poorly thus producing sickly chicks. Too small ones are also not good, as these may not have enough yolk to sustain growth. Whether the eggs are from your farm or outsourced, always pick for hatching those of medium size and as much as possible, stain-free eggs. Look out for signs of cracks, holes and other abnormalities in the shell. Avoid those with irregular shapes and stay away from those with suspicious marks. Bacterial infection should be prevented right from the start.

The prices of incubators range from as low as Kshs 15,000. For a medium sized business you can invest in a 1200 eggs per week incubator which should be going for Kshs 140,000. Taking 70% hatchability, you should be selling about 800 day old chicks per week. At Kshs 100 per day old chick, this translates to a gross Kshs 80,000 per week or Kshs 320,000 per month. Other than feeding the
parent stock or purchasing the eggs, there are no major expenses and the profit margin can easily be Kshs 200,000 monthly.

Care and management of incubators

The success of any hatching of eggs depends on the quality and fertility of the eggs being incubated and the care and management of the incubator. The critical factors to consider in management are temperature, humidity, ventilation and rotating of eggs. Failing to meet the requirements of any one of these invariably results in disastrous consequences. Farmers often ignore or forget some of these requirements and as a result suffer losses and become frustrated with the incubator or the business as whole.

Ensure good egg quality

If you are going to produce the eggs in your farm it is important to consider the hens that will lay the eggs and the cocks that will fertilize them. Select parents with proven fertility and good lineage. Purchasing eggs is tricky but get a reliable source in terms of fertility. Before placing them into the incubator, you need to inspect the eggs for normal shape, good size and smooth unbroken shells.

If the eggs are not going to be placed in the incubator immediately, they should be stored in a cool and humid area (preferably at 12 - 15°C and 70-75% humidity) with the large end facing upwards, and turning them daily. You can store the eggs up to 10 days but it has been observed that eggs that are set in the incubator less than 7 to 10 days after they are laid have the best hatching. Allow cool eggs to warm up to the ambient temperature before putting them into the incubator.

Do not wash eggs unless it is necessary, and in that case always use a damp cloth with water warmer than the egg. This causes the egg to sweat the dirt out of the pores. Never use water cooler than the egg. Also, do not soak the eggs in water.
Using simple candling instruments regularly test the quality of eggs by candling. All the eggs of the same age should look the same. Infertile eggs and dead embryos can be detected and the eggs removed before they can produce unwanted gas. Candling is best started on the 9th day and a second one done after 14 to 18 days of incubation. After the 18th day no candling of eggs should be done so as not to disturb the growing chicks.

**Using the incubator and other procedures**

**Setting up of the incubator**

Place the incubator in a room with good insulation, little fluctuations in temperatures and good ventilation. If you are using the incubator for the first time, operate it for at least one week without eggs. Set up a thermometer on the egg tray with its bulb at a level with the top half of the eggs. If you have several thermometers check to see that the heat spreads evenly across the tray. Open up 2 to 4 air holes and wait for the temperature to stabilize, making adjustments before the incubator settles at the right temperature.

If you are using a lamp, turn the lamp wick up or down to adjust the heat until you have a constant temperature of 38.9°C. Fill up the lamp regularly with kerosene to ensure constant supply of heat. When the temperature in the incubator has remained stable for at least 24 hours without having had to adjust the thermostat regulation can be said to be complete.

Completely fill the water tank with hot water at about 40°C. The heat will spread better if there is no air in the tank. Put a container of hot water in the incubator and check the humidity level. When everything is set up properly the eggs can be put on the tray.

**Temperature during incubation**

The optimal temperature in the first two weeks is 38.9°C. Any rise above 40.5°C is fatal for the embryos. Also a drop in humidity can have disastrous results. From the 19th day onward reduce temperature to 36.1°C because the chicks will be producing their own heat. If new-born chicks with open beaks can
be made out, they are trying to lose heat by breathing more. This might indicate too high a temperature in the incubator.

**Humidity**

Humidity levels are influenced by the amount of ventilation and humidity levels of the incoming air. You can measure humidity by use of a hygrometer but they are too expensive. A wet bulb thermometer is a cheaper alternative. Adjust the humidity by putting containers of warm water inside the incubator. Use water at body temperature rather than cold water to prevent the temperature from dropping. Put wet sponges or clothes in the incubator if you don’t have enough containers. Or use a thoroughly cleaned sprayer filled with warm water and spray into the incubator through the ventilation holes.

**Ventilation**

Growing chicks may suffocate or choke if there is insufficient ventilation. Open the ventilation holes regularly. Every time you open the door to turn the eggs fresh air will enter. When you stop turning the eggs after 19 days you may need to open extra holes. At least two holes will have to be permanently open in any case.

**Turning the eggs**

Hatching results will be very poor if you do not turn the eggs. Turn the eggs 3 times a day at regular intervals for the first 19 days and do not move them. Turning is no longer necessary thereafter.

To accurately do this mark one end of each egg, say with an X, and the other with an O. Turn them all so that in one day all have the Xs facing upwards and on the next, the Os. This is very important to ensure that there is even temperature on all surfaces of the egg. Leave the door of the incubator closed as much as possible to prevent the incubator from cooling down. The best way is to take the entire egg tray out, turn the eggs 180° and put in the egg tray the other way around. Exchange the
eggs at the centre with the eggs on the edges of the tray if the heat is not reaching all the eggs equally. Keep your hands clean.

**During Hatching**

Do not help the chicks from the shell at hatching time. Prematurely helping the chick hatch could cripple or infect the chick. Humidity is critical at hatching time.

As soon as the chicks are dry and fluffy or 6 to 12 hours after hatching, remove the chicks from the incubator. Remove all the chicks at once and destroy any late hatching eggs.

**During Power Outage**

In case of power failure ensure that eggs are as warm as possible until the power returns. Do this by placing insulation materials like blankets over the top of small incubators. Then place lit candles under the box that covers the incubator to warm the eggs. The heat from the candles can easily keep the eggs above 32°C until the power returns. Embryos have survived at temperatures below 32°C for up to 18 hours. Candle the eggs 4 to 6 days after the outage to check whether they are still viable and if not, terminate incubation. A power outage usually delay hatching by a few days and decrease the hatchability to 40-50 percent.

**Sanitation of Incubator and Equipment**

Lack of sanitation decreases hatchability. Always thoroughly clean and disinfect the incubator, all hatching trays, water pans and the floor of the hatchery before and after use, no matter what type of incubation you use. The incubation room and egg storage area should equally be kept clean.

**Keeping Records**

Write down the date on which the eggs were put into the incubator. Note the temperature and humidity twice a day. If hatching results are poor at the end of
the incubation period, your records will tell you whether the temperature or the humidity levels were to blame.

Normally hatching rates vary from 50 to 70%. It is rare to achieve 80% or over.

Candling eggs

Candling gets its name from people who used candles as the light source to view the inside of an egg. Candling is done to monitor how the embryos are growing by examining the egg fertility, embryo viability, moisture level and other aspects. In short candling eggs allows you to keep track of the progress of your egg during incubation.

Candling torch

You can use a candling torch or make your own candler using a light bulb as the light source. The light penetrates the egg and makes it possible to observe the inside of the egg. The easiest way to make a candler is to place a low energy light bulb inside a cardboard box. Cut on top of the box a big enough round hole to stand the large end of the egg. Place egg onto this hole and turn the light on. Do this in a dark room and limit the exposure of the egg to the hot light source and you will be able to observe the contents of the egg.

The content of white eggs with thin shells is easier to see than that of darker colored eggs and those with thicker shells. Eggs can be out of the incubator for 20 – 30 minutes without any impairment.

The presence of embryos can be confirmed easily after 8 to 12 days of incubation. With practice you can be able to identify the embryo located in the large end of the egg by the spider-like blood veins radiating under the surface of the shell. The embryo occupies most of the egg by the 18th day and chicken
eggs should not be candled after that. The air sac size increases as moisture evaporates from the egg. If the humidity is too high, the air sac will be smaller and if too low the air sac will be larger than normal.

Non fertile egg

If the embryo dies, the blood draws away from the embryo and forms what is called a blood ring. Such abnormalities as bloody whites, blood spots, meat spots, and cracked shells can be detected. By being able to identify and remove non-viable incubating eggs you avoid the risk of rotten eggs exploding and infecting your hatch with dangerous microbes. Healthy embryos will respond to the light by moving. Sometimes the movement is very sluggish and it can take 30 to 40 seconds for the embryo to move when held under the candling lamp. This indicates the embryo is not healthy and the egg should be discarded.

# END ######

**Types of egg incubators available in Kenya**

Incubating chicken eggs can be a very good way of making money and a good business model for farmers interested in the venture. But to go commercial in this venture you will need quality artificial incubators instead of relying on natural methods of incubation. In this article we want to explore the various types of chicken egg incubators available in Kenya and how to choose the best depending on your situation.

A good incubator is a requirement if you want to avoid disappointments faced by many farmers. However, management practices around the incubator and quality eggs are equally key inputs towards the success of this venture.

**Types of incubators**

An incubator imitates a hen by providing an environment for eggs to hatch into chicks. It keeps the eggs uniformly moist and warm, for a period of about 21 days. Different sources of heat can be used to warm the eggs, the most common being electricity, solar energy or fuel such as charcoal, paraffin or gas.
Various types of incubators have likewise emerged on the basis of these sources of heat.

**Manual egg incubators**

If you don’t have access to electricity then the best option is a manual incubator. This provides an easy and affordable way to incubate eggs. A manual incubator can use charcoal, kerosene or gas to heat and retain eggs in the hatching chamber where the eggs are placed. Eggs are turned manually; temperatures and humidity regulation is also manual. Different capacities are available ranging from 50 up to 300 eggs and the cost range from Kshs. 10,000 to 20,000.

However there has been complains on the output of these kind of incubators. The average hatching rate as reported by farmers range between 50 and 60% with good management. However the use of thermometer to regulate temperature and placing water next to the eggs to regulate humidity has improved performance for most farmers.

**Electrical egg incubators**

This kind of incubators requires a constant power supply if the eggs are to be hatched. Any breakdown in the power supply as is usually frequent in Kenya causes the eggs to lose their hatching value and must be destroyed.

The incubators can be manual, automatic or semi-automatic. Those that are automatic come complete with a hatching tray, thermostat to control accurate incubation temperature and hygrometer to control humidity during egg hatching. The egg tray has an egg turning system for turning eggs automatically. An air circulation system ensures that air is circulated evenly in the incubator and that eggs hatch at the same time. Others are connected to computers, internet, cell phone-based alarms and remote-control functions for easy monitoring and control of activities while on the move.

The incubators are available in capacities ranging from about 60 eggs to 1200 eggs with costs currently ranging from Kshs. 15,000 to 140,000.
Solar egg incubators

The solar incubator uses solar energy to hatch eggs. They are meant for use where electricity is not reliable. A solar panel connected to a battery system with charge controller assures 24-hour power supply. A combination exists where you can use a solar system when there is power failure. Heat is controlled automatically in the entire unit by use of a thermostat to ensure no damage is done to the eggs due to over heating. Fans are installed for fresh air circulation. Humidity is usually controlled manually by placing water container inside the base. The eggs are also turned manually.

One advantage with this is that when the system is not in use, the device can be used to provide power for lighting. Unlike electrical incubators the eggs need not have to be disinfected before placing them inside and after every hatching the entire device can be washed and cleaned.

The incubators are available in capacities ranging from 100 to 1,2000 eggs. Prices range from Kshs 15,000 to 100,000.

Things to consider when selecting an incubator

Source of heat

Obviously the first is to know the source of heat available to you. In the rural areas where electricity is lacking a manual incubator that uses charcoal or kerosene or the solar incubator are the obvious choices depending on your account balance. On the other hand if you have electric power then you can take advantage of the advanced features of the electrical incubators. But of late there has been concern that many farmers are abandoning the electrical incubators due to frequent power outages and the high costs of electricity. A system that combines solar and electric incubator is a good back up where there are electric problems.

If you are going to entirely depend on solar power, ensure that the solar panel provides twice the power that can maintain the battery when it is at full charge. Compare models, take your time and seek advice.
Market

If you are in business then the size of the market is important because it will determine the off-take of chicks and therefore the size of the incubator. Select an incubator that you can adequately supply with eggs. It will be useless to have a large incubator when you can only supply a few chicks. If you produce eggs for hatching, the egg production should match a weekly setting plan.

After sale service

When you purchase an incubator, it will come with an instruction manual where every step of the incubation process is explained and therefore guarantee successful hatching. And as part of after sales service, manufacturers provide various kind of support. Some of them guide and provide information or training on the incubation procedure and business advice that you need in order to make your hatchery a success. Look for other available services that they offer to farmers.

Warranty

Look for those that carry at least a two-year warranty on all the spare parts, especially if it is an electrical or solar incubator.

Eggs produced by local poultry are often seen as money lying loose that needs to be collected to prevent losses. However keeping local chicken should be to make profit hence it is necessary to increase the egg produced as much as possible. The bulk of local poultry lay eggs only for a short period in the year and this need not be the case. With a little more attention local birds can be made to yield eggs throughout the year.

The measures discussed here are also applicable to exotic layers on extensive systems of production.

Determine the egg laying percentage
Egg laying percentage is always the best measure of egg-producing capacity and has the advantage in calculating the value of the hens. Relying only on the actual number of eggs produced may not be very valuable as it does not reflect the efficiency of the birds in producing the eggs.

Calculate the egg laying percentage by dividing the number of eggs laid by the number of layers and multiplying by 100. Obtained this figure on a daily basis and compute the average for the week or month. This will help in assessing the performance and setting targets for improvement. Averages below 70% means the feeds are going to waste. Always strive to achieve percentages above 80%.

**Select Layers**

Laying hens are nearly always noisy. They work and hunt for food all day, and are the first off the roost and the last to go to roost. They are nervous and very active, keeping themselves up to the greatest possible pitch.

An indication that the hen is laying is when the pelvic bones are soft and pliable, and spread sufficiently to allow three fingers to be placed between them. Experience has shown the hen is not laying at the time of examination if the pelvic bones are hard, bony and close together.

Select hens that are healthy; comb, wattles and face red; eyes bright and lustrous; neck not short, but medium to long; breast broad and long, sloping upward; back, long and broad; abdomen, wide and deeper than breast; shanks, well spread and rather long; well-spread tail

Only mature pullets should be selected for laying. All birds that are stunted, undersized, lazy, weak or otherwise undesirable should be weeded out and sold, especially those that are inferior to other stock hatched at the same time.

Only hens that have proved their worth in the previous year should be kept over for a second or third year. They usually make good breeders and the breeding flock should be selected from them rather than from pullets. Too often the reverse practice is followed whereby hens that are in best condition are sold and
inferior ones used for egg production. This is suicidal to profit and should be reversed.

**Improve Laying Ability**

Hens should be brought into laying as early as possible. Pullets that delay in coming to lay are naturally poor layers and soon burn out. Such fowls should not be used for breeding and the sooner they are taken out of the flock the better. In the long run such control helps in improving the flock and it is better to have some system of selection than to have none at all.

Put everything in readiness for egg production. Pullets and hens should be placed in their separate quarters early enough and special care taken to prevent overcrowding. This way the flocks get accustomed to their quarters and there is less danger of upsetting them when they begin to lay.

**Manage Laying Stock**

It is just as important to feed well for eggs as it is to breed well. Fowls do best when given plenty of space to forage in. At all times there should be abundant clean water available to the hens.

During cold weather increase the energy content of the feed by adding carbohydrates to the normal ration. As the weather grows colder larger quantities of energy are used to maintain the body heat. Egg production can continue without interruption even during extremely cold weather if the hens are fed well.

Plenty of shade should be provided during hot weather and the houses kept as open as possible so as to be cool and comfortable for roosting. Reduce the energy content of the feed by reducing the amount of carbohydrates in the ration.

Hens that are molting should be fed well but should not get a ration too rich in protein because they are not laying. They do better when given a ration richer than usual in energy content. By proper management, many good laying hens
can lay an occasional egg even while going through the molting.

Hens that have stopped laying should be culled out and managed differently from the rest of the flock. A layers ration and reduced exercise can start them laying again. Those that do not go back to laying within a reasonable time or lay for only a few weeks and then stop should be sold.

**Manage pullets**

Pullets can be fed more highly than hens during the early months of growth. At this time, they need abundant protein, because they are not only growing in flesh but are filling out their bones and either preparing for, or actually laying.

A pullet is by no means fully mature when she starts to lay. It needs ample food to complete its development. Pullets should neither be forced to begin laying early nor to delay laying.

**Handle birds gently**

Hens should be protected against sudden changes. Excitement due to rough handling and fear from any cause are detrimental to the birds. Often the entrance of foreign objects, animals or visitors in the pens will cause disturbance, so these should be kept out as much as possible. When it is necessary to carry some unfamiliar object among the flock, this should be done gradually. Even the wearing of unusual attire, especially if this is of some flashy color, will disturb the fowls until they are accustomed to it.

Although birds on free range are not so likely to be disturbed, making sudden motions, calling loudly, or otherwise startling the fowls should be avoided. Enter the pens as quietly as possible and if necessary signify entrance by making some noise such as low whistling, so the hens are alerted of your approach.

Hens, especially laying hens, become attached to their quarters. They therefore should not be unnecessarily moved as this also affects the laying. Changes should be done with the least possible disturbance where it is absolutely
necessary. When hens must be handled or carried, this should always be done at night and the fowls should be held gently with the hand beneath the breast, never by the feet.

**Manage Broodiness**

Broodiness is a characteristic of hens. Persistent brooders should be culled out and never used as breeders. But in otherwise normal hens, *broodiness can be broken* when necessary. One of the quickest ways is to confine the hens with a reserve male in a pen where there are no nests and feeding them well on a layers ration. Often the hens will begin to lay within a week or ten days. Under no condition should the hens be starved because it is not only cruel but also causes injuries to the hen.

############################ END ########################################