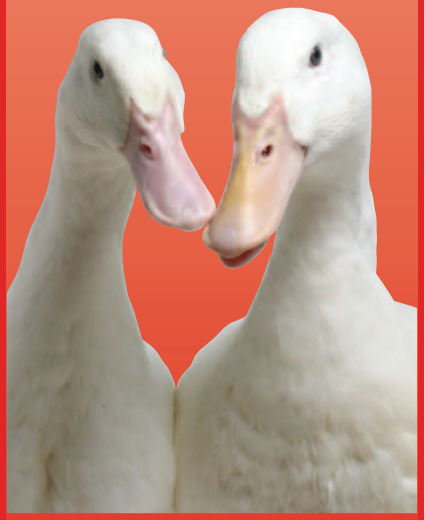
SM3

PARENT STOCK
MANAGEMENT HANDBOOK



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Cherry Valley®

This Handbook

Cherry Valley has invested for many years in a research and development resource covering all aspects of duck production. This handbook is based on that research, along with more than 50 years' experience of integrated duck production and the benefit of working with customers in all of the World's important duck markets.

The modern duck industry is an international business, with production in many countries and varying climatic and environmental conditions. This handbook is not designed to provide definitive information on all aspects of duck management in every scenario. It is a guide to best practice, aimed at helping customers produce the maximum number of best quality hatching eggs, as efficiently as possible, from their **Super M3 (SM3)** parent stock, whilst maintaining flock health, vigour and wellbeing.

Much of this technology is unique. It is important not to rely on previous experience of other ducks, but to apply **Cherry Valley** management to **Cherry Valley** ducks. Users must be aware of local legislation, which may influence the management practice that they choose to adopt. **Cherry Valley Farms** cannot accept any liability for the consequences of using this information as it does not control the detail of its application.

Performance Objectives

A high standard of management and husbandry is required to maintain breeding ducks in good condition. Feeding and bodyweight control, lighting and mating ratios all require special attention to help the flocks reach their potential output of day-old ducklings.

This management handbook should be used in conjunction with the "**Technical Data Sheet**" relating to the specific parent stock combination being used (i.e. **Heavy** or **Medium**).

The performance on actual flocks, grown and managed in UK conditions, is used to set the objectives given in the technical data sheet. Comparative data from around the world shows that the objectives can be achieved in other climates, with different feed and husbandry systems, providing the basic principles are accurately applied.

Technical Support

Additional information on specific issues is available from the Livestock Division Technical Department. The Technical Desk is maintained to provide a technical service to **Cherry Valley** customers worldwide and can be contacted as follows:

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Accommodating Parent Ducks

In order to optimise performance of Cherry Valley breeding ducks it is important that they are housed in suitable accommodation. To minimise the risk of the spread of disease, ducks are ideally accommodated on single age farms but with good management practices they can achieve excellent performance on multi-age sites. They can be accommodated in different houses according to their stage of development or in a single house throughout their life. The accommodation used for the parent ducks must be capable of providing a safe and comfortable environment.

The following fundamentals should be taken into consideration:-

Accommodation Organisation

To minimize the possibility of disease transmission, parent ducks should be located as separately as possible from other production areas. A minimum distance of 3km is a reasonable guide. Within a parent operation the maximum level of isolation and disease protection is achieved when each farm accommodates only one age of duck, it is recognised that this is not always practical but with appropriate management, ducks can perform well on multi-age sites. Within a farm, houses can be used for different purposes; for example brooding, rearing and laying, with each stage being carried out in a different house or, the ducks can be accommodated in the same house from day-old to death.

Suitability of Accommodation

A wide variety of house designs are used to house ducks according to the differing climatic and hence environmental conditions worldwide. The housing used must be capable of accommodating the ducks comfortably, providing protection from predators, adverse weather conditions and contact with potential pathogens. It must provide adequate floor space and ventilation according to the number of ducks to be accommodated, as well as having the ability to control the lighting via an adjustable time clock. It is important that all finished surfaces of the housing are appropriate to ensure effective terminal cleaning and disinfection.

Environmental Comfort

In situations of extreme or very variable ambient temperatures, specific ventilation requirements, with cooling facilities and / or dual ventilation, systems may be required to keep the ducks within their thermal comfort zone (8-23°C). Heating is unlikely to be necessary with adult ducks except in the most severe winter conditions. Details are available from the Cherry Valley Technical Dept.

Water Availability and Floor Condition

Unless a particular location has very specific circumstances, concrete floors are fundamental to allow for effective cleaning and disinfection and to maintain good litter condition. Being water fowl, ducks enjoy access to water and will create very wet conditions if the water is not properly managed. To maintain good litter condition drinkers will ideally be located (after the brooding period) on an elevated slatted drinker area, called a drinker island. A drinker island will allow waste water from the drinkers it to drain away rather than dampen the litter. To avoid foot problems, only good quality plastic slat should be used. Access to the drinker island should be by gently sloping ramps and the drinking island area should be bordered by a low solid fence in order to stop water being splashed from the drinkers on to the litter.

Note: In breeding ducks houses it is recommended that slatted floor areas should not exceed 10% of the total floor area.

Maintenance

Ensure that houses and equipment are routinely checked and maintained in order to avoid electrical and/or water supply failures which can seriously reduce egg production. Check regularly for damage to drinker islands and access ramps in order that any sharp edges can be quickly repaired before causing any injury to the duck's feet.

Good stockmanship is key to the success of any livestock business, but poultry farming is one of the most demanding. The job of the stockman is to take care of the animals in his charge; he or she must be conscientious, observant and committed to the small details of flock management. In case the full time stockman is not available, perhaps due to holiday or illness, a suitably qualified relief stockman should be provided. Ducks respond positively to routine, make sure that the working day starts at the same time every day and that the tasks of feeding, egg collection and bedding are always done in the same way. Any changes should be made slowly, one area at a time and with calmness and care. Keep a daily record of when key tasks have been completed and any observations or changes that have been made to feed allowance, etc. and remedial action that has been taken.

Placement of dayolds

Male and female parent stock day-olds will arrive from Cherry Valley in separate, marked boxes. The males will have a web mark between the outside-right and middle-right toes. For best results rear the sexes separate until they are ready to be mixed just before point-of-lay (remembering that a small number of "imprinting females" must be placed with the males throughout rearing, see the section concerning mating ratio).

A Good Start

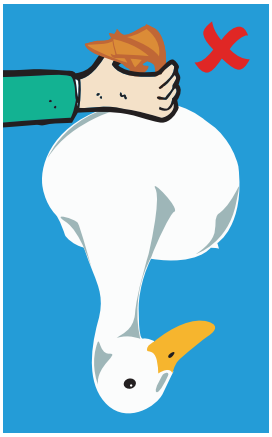
Day-old parent stock often travel long distances and may arrive at their destination dehydrated. To avoid any long-term disease it is important for them to find water as soon as they have been tipped from the boxes. Provide additional drinking points in the brooding area until the flock is 3-4 days old. The most successful way of doing this is to pour 12mm of water in each feeder tray when placing the dayolds under the brooder. Keep replenishing the water to the 12mm level at regular intervals. After 4 hours of this practice stop adding water and once the trays are dry, start to add feed to the feed trays.

The objective is to ensure that the day-olds all find water within 6 hours of placement. Make sure that the water provided over the first few days is not cold but at house temperature. This can be achieved by filling cleaned, plastic drum reservoirs the day before placement and simply standing them in the house.

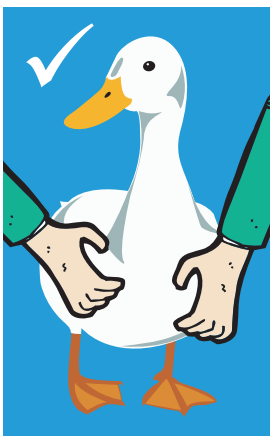
Catching and Handling

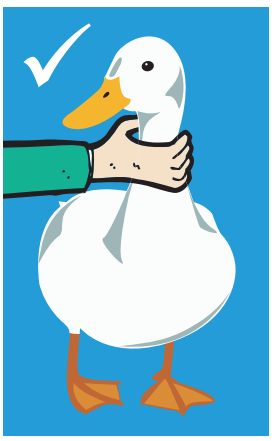
Catching ducks for routine weighing and sorting requires the use of a catching frame. Frames can be made from plastic or wire mesh, fixed to three timber frame sections 2.5 m x 0.7 m connected with 2 sets of hinges. They need to provide a flexible, easy to move pen in which the ducks can be held tightly together. Carry day-olds either by their necks if holding 3 or 4 ducks, or by gently gripping their whole body if handling individuals. Young and adult ducks can be lifted by the neck and held by the wings, taking care to support the body.

- Do not catch, lift or hold the ducks by their legs, which are easily damaged.
- During the rearing period always carry out any jobs involving handling ducks before feeding.
- In hot climates, carry out tasks that involve handling or moving ducks during the coolest periods of the day.



- Use a raised area to support the duck when lowering it back onto the floor after catching.





Mortality and Culls

Liveability is higher for ducks than for most other poultry, but it is normal for a small number of individuals to develop some physical injury or other abnormality that results in death or requires culling. All losses must be recorded and the size of the flock adjusted accordingly. If the losses from mortality and culling are consistently above 0.25% per week, the reason should be investigated to establish the cause.

Pay special attention to damage to, or localized infection in, the ducks' feet and legs. This can be an indicator of poor quality or badly maintained drinker islands, outside runs and litter condition. Ducks that are limping will lose condition fast and ultimately require culling.

The use of hospital pens is not recommended. Experience shows that ducks placed in such pens rarely recover and they provide a reservoir of disease that is a risk to the rest of the flock. Cull sick ducks as soon as possible and record their condition or injury.

Mortality and culling levels must be reviewed every day. Adjust the feeding level if several ducks are removed from a rearing pen at the same time.

Uniformity & Selection

A uniform flock is easy to manage and will produce the best and most consistent results. The work needed to produce a uniform flock begins when the chicks arrive and the first job is to make sure that they find feed and water quickly. Controlled feeding is practiced during rearing and the following are key points for success:

- Weigh the ducks properly, it is important to understand the growth pattern;
- Take account of the growth pattern when adjusting feed amounts;
- Good feed distribution is essential – each individual duck must get an equal feeding opportunity every day.

The target is to achieve uniformity of more than 80% of the ducks within ±10% of the average bodyweight, which is equivalent to a coefficient of variation of less than 8%. With attention to detail the flock should have uniform bodyweight throughout rearing, but if uniformity is poor it can be improved by grading (more information on uniformity and grading can be found in the following sections of this handbook and from the Technical Desk).

Between 18 and 20 weeks of age, after the flocks have been put on to hopper feeding, the ducks should be sorted and counted and checked for sexing errors. The females should be checked first before being divided equally between the laying pens. Males should then be checked before being added to the females at the rate of 1 male to every 5 females.

During the sorting process any females showing signs of poor condition, injury or abnormality should be rejected. Similarly only fit, good quality males should be selected for use.

All rejected females and surplus males should be removed from the house and culled as they will be of no further breeding value.

Notes: For sexual imprinting reasons it is important that males are never be kept completely separate from females at any time during the rearing or laying periods. If they are, they will not mate actively with females at a later stage or, if separated at maturity, they will kill the weakest in the group.

Ducks are very hardy with a strong immune system and are resistant to many of the diseases that affect other types of poultry. They are most susceptible to disease when they are young (the first 35 days). Maximum effort must be made to protect them through this period to help ensure an ongoing disease free status and hence subsequently good production performance.

House Cleaning

At least 4 weeks before the ducks arrive on a farm the house in which they are to be accommodated and the equipment which they will use should have been thoroughly washed, disinfected, and, if possible, fumigated. Ideally the houses and equipment should be swabbed and tested between washing and disinfection to provide a check of the effectiveness of the cleaning process. Full details of house cleaning procedures can be provided by the Technical Dept. The houses and equipment must have had time to dry before the ducks arrive. It is very important to ensure that all water lines, drinking and feeding equipment, which have been disinfected, are flushed and/or rinsed with clean water in order to avoid any inadvertent poisoning.

Isolation

Allow only essential visitors. Any visitors who must enter the house should not have been in contact with other live ducks for 2 days and must be provided with clean protective clothing and footwear which is dedicated to the facility. Personnel who visit, or who are working with young ducks, must not have any contact with other poultry, and especially other ducks, either at work or at home.

Litter

Small quantities of clean, dry, friable litter should be spread on the floor at regular intervals in order to keep the ducks clean and dry - daily if necessary. Although ducks are water fowl they do not like to be kept in a wet environment and will quickly lose condition.

Ventilation

Ventilation is a vital factor in keeping the environment around the ducks clean. Good ventilation removes dust, ammonia and foul air, as well as reducing relative humidity and litter moisture. Regular adjustment of ventilation equipment to keep the house environment fresh and clean is therefore very important. Ammonia levels should be kept below 10 ppm. Measurements can be made using a small manual gas detector. Detailed ventilation recommendations can be obtained from the Cherry Valley Technical Desk.

Vaccinations

Vaccination programmes vary according to the disease situation in different countries and the availability of vaccines. Local veterinary advice should be obtained when developing a vaccination programme. All vaccines should be obtained from a reputable vaccine manufacturer and applied under veterinary advice. Grandparent ducks in different countries will be subject to different vaccination programmes and therefore the parent duckling that they produce will have different levels of parental immunity, the Cherry Valley Technical Desk will advise on this. Further information can be found in the Cherry Valley 'Biosecurity and Health Manual' and from the Cherry Valley Technical Desk.

Medication

Medication should only be applied to ducks in relation to a specific problem and under veterinary advice. Local legislation needs to be considered when using medication, in particularly antibiotics. Conditions such as coccidiosis or intestinal worms do not normally affect ducks so no routine medication need be applied.

Vitamin / mineral / electrolyte preparations may be used and can be beneficial to ducks during periods of stress; for example prior to and following handling and/or movement. Under normal management circumstances it should not be necessary to use them on an ongoing basis.

General Management

- Keep the houses and surrounding areas clean, tidy and free of vegetation.
- Maintain an effective and ongoing vermin control programme.
- Keep wild birds out of the houses.
- Use good quality clean, mould free litter and feed materials.
- Provide wheel dips, foot dips, showering and changing facilities and clean protective clothing on entry.
- Disinfect and clean equipment to ensure that the hygiene programme is properly supported.
- Provide training, and display signs and notice boards, to ensure that all personnel are fully aware of, and understand the potential disease risks.

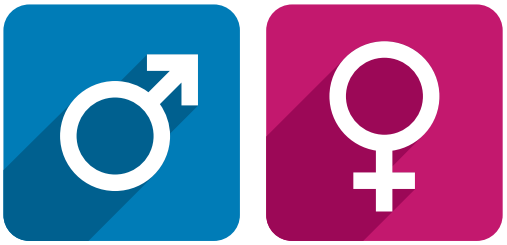
Site Health Plans

A 'Site Health Plan' should be prepared for each site. These plans should include:

- Site address and contact details
- Disease alert procedures
- Biosecurity procedures
- Flock monitoring procedures
- Flock vaccination programmes
- Farm sanitation procedures
- Egg Handling and washing procedures
- Medication usage

Mating Ratio

The accurate control of bodyweight during the rearing period is vitally important to the achievement of optimum breeding performance.



The male hybrid ducks are produced from lines which have been selected with an emphasis on growth rates and feed efficiency whilst maintaining strong fertility. The emphasis for female ducks has been towards reproductive traits. To enable bodyweight to be controlled as accurately as possible and to meet the very different male and female targets, it is essential to rear the males and females separately to the age of 126 days.

To ensure that the males are correctly "sexually imprinted", a small number of females must be kept with the males from day-old. These females are called "imprinting females". If males are kept without female, even for short periods, homosexuality and hence poor fertility will result.

Recommended mating ratios:

- 1 to 126 days:
  - Females separate from the Males
  - Males + 1 female to every 4.5 males
- 126 days to depletion:
  - Recombine males and females at the rate of 1 male to 5 females.

During the rearing period the bodyweight of the imprinting females in the male pen is ignored. They are simply included in the feed calculation as if they were males i.e. the feed allocation for the pen is based upon the total of the males + the imprinting females, multiplied by the feeding level.

The bringing together of the males and females for lay should be done at 126 days.

Floor Space

The amount of space provided for each duck at each stage of its life will have a significant effect on the levels of stress it is subjected to and hence its ultimate laying performance.

Dayold to 7 Days of Age

Either 'Spot Brooding', which has a localised heat source allowing duckling access to cooler areas of the house or 'Whole House Brooding' can be used. Please refer to the section of this manual on 'Heating' for further reference.

With Spot Brooding, on arrival, the ducks should be placed in an elliptical brooder surround in order to keep them close to the sources of heat, water and feed. Surrounds normally start with an average dimension of 4 x 7m and are constructed of sections of flexible board 0.5m high, each surround will hold 600 parent ducks. From the end of the 2nd day the brooder surround should be made slightly larger each day. On the 7th day the brooder circle can be removed allowing the ducks access to the whole pen area.

With 'Whole House Brooding', surrounds are not normally used and the duckling are allowed free access to larger areas of the house.

7 Days to 28 Days of Age

Start by providing a minimum of 0.2m^2 per duckling, increasing to the full rearing allowance of 0.45m^2 per duckling at 21 days.

29 days to 126 days of Age

The rearing pens should provide a minimum space of 0.45m^2 per duck. Houses should be divided into equal sized pens by means of 0.7m high wire or plastic mesh fences, each pen accommodating up to 1,000 parent stock ducks. As control of the bodyweight is based on controlling the feed according to the exact number of ducks in each pen, the security of the pen fences is important to stop ducks migrating from one pen to another. The condition of the pen fences should be checked regularly and any necessary repairs made immediately. Recount and balance the pens if there is any suspicion of migration having occurred.

127 days to Depletion

The laying pens should provide a minimum of 0.55m2 of floor space per female.

Semi-Intensive Accommodation

In situations where a combination of housing and outside run area is used, then the inside space allowance can be reduced to 0.3m2 per female, together with an allowance of 0.3m2 per female of outside run area.

Available Floor Space

It is important to remember that calculations on house area are normally based on the assumption that the whole floor area of the house is available to the ducks. Materials such as litter and feed or equipment should not be stored on the floor of the house taking up space which has been allocated as part of the floor space for the ducks. The house design and equipment layout should ensure that all the floor space is accessible and suitable for the ducks.

As with other types of poultry, young ducks are homoeothermic (having a body temperature that is constant and largely independent of the temperature of its surroundings), but they must be kept warm for the first few days. The level of heating and duration of the brooding (heating) period will depend on the ambient temperature, which can be affected by the seasonal changes and hence where the farm is located. Heating equipment provides either Spot or Whole House brooding and both systems can provide good conditions for ducks. The most commonly used is Spot Brooding, because it provides the opportunity for ducks stay in their temperature comfort zone by moving either closer to, or further away from the heat source. Space heating does not allow this behaviour, but it may be more effective in cold climates.

Duck Comfort

In hot, tropical climates, heat will normally be needed for only 7 days, whereas in cold, temperate climates the brooding period may extend to 28 days. Duck behaviour will tell stockmen whether the temperature is too hot or too cold. When the temperature is correct the ducks will be active, feeding and drinking and evenly spread around the pen. Although ducks are gregarious animals and like to sit in groups, experienced stockmen will be able to distinguish typical hot and cold behaviours.

It is important to spend time watching the ducks as a flock kept at the correct temperature will have periods when many of the ducks are resting. Stockmen should allow themselves time to make an assessment and if adjustments are made it is important to watch the response of the ducks. The use of thermometers to measure the temperature of the air and the floor is a valuable aid to management, but the ducks will tell you whether it is correct.

Once the ducklings are fully feathered no further heat will be required unless house temperatures drop below 1°C. At temperatures below 1°C the water supply may freeze which will dramatically affect the performance of ducks in lay. Houses in cold climates may need to be fitted with a background heating system, which will help to reduce feed consumption, maintain production and improve litter condition. Houses in hot climates will benefit from the installation of an evaporative cooling system.

Hot Behaviour	Cold Behaviour
Sit away from the heat, often close to the edge of the pen	Sit close to the heat source and huddle together
Quiet, little movement among the flock	Quiet, although sometimes there may be distress calls, little movement among the flock
Adopt a 'Hot' posture, sitting or lying with wings and/or feet outstretched	Adopt a 'Cold' posture to conserve heat
Panting in more than 75% of the ducks	No panting
Low feed consumption	Low water consumption
Wet backs from trying to get into the water	

Equipment

In hot, tropical regions, the heat from four ordinary 60 Watt incandescent light bulbs mounted on a wooden frame and suspended half a metre from the floor in the centre of the brooding area is often sufficient. The target temperature when the ducklings are placed is 32oC, so it is easy to make the ducklings too hot in these conditions. It is not necessary to switch the brooders on if the ducklings are comfortable, but even in hot climates some extra heat may be needed during the night time.

In cold climates, especially during the winter, the capacity of the heating system is an important consideration. If the ambient air is close to zero Celsius, it will be necessary for the system to have sufficient output to raise the temperature in the brooding area by at least 30oC; while maintaining the minimum ventilation rate, keeping the whole structure warm and preventing the water from freezing. In these conditions, a combination of hot air heaters, to maintain the background temperature and canopy brooders is the best option.

In temperate climates, use gas or electric brooders with a heat output of around 5,000 Kcal. A 0.5m high, 4 x 7m, elliptical, solid brooder surround with two brooders is used to protect the ducklings from draughts and keep them within a pre-defined area close to the heat source, food and water during the first few days. It is important however that the ducks have the opportunity to move away from the heat source. One surround per 600 parent ducks is recommended.

Procedure

Set up the required number of brooder surrounds and brooders in the brooding area. Locate thermometers at various points in the house and place one on the litter directly below each brooder. It is important to stabilize a temperature of 35oC directly under brooders before the ducklings arrive on the farm. Depending upon climate conditions, it may be necessary to have the brooders operating up to 48 hours before they arrive to ensure that the brooding area and house floor is up to temperature. The temperature profile illustrated in the graph is suitable for most conditions, but it is a guide and temperature must be adjusted according to the behaviour of the ducklings.

In very cold climates it may be necessary to provide some additional space heating to maintain room temperature as described.

Provide adequate minimum ventilation during brooding, especially when gas or oil fired heaters are used. The carbon monoxide that they produce is poisonous to both staff and ducks. Carbon monoxide levels can be checked using a small manual gas detector and further details are available from the Technical Desk.

Use the minimum amount of brooding heat

- Provide the ducklings with plenty of space to move away from the heat.
- Remember to make allowances for ambient temperatures falling at night.

Check thermometers on a regular basis.

In order to reduce the volume of air heated for brooding, a section of the house can be partitioned by means using a plastic curtain. Depending on the design of the house and the climate, however, it may be necessary to provide background heating in the empty area. It is important that any partitioned area has adequate ventilation.

Ducks should be provided with an easily accessible supply of clean drinking water. Being water fowl, ducks tend to use significant amounts of water, much of which is not drunk. The allowances made for the supply of water are therefore very important and should take account of a total usage of between 1.5 litres per duck per day in cool climates and up to 5 litres per duck per day in hot climates. Water meters should be installed in all houses and daily water usage recorded.

There are various types of drinkers and systems that can be used for ducks and each drinker type and system have different levels of water usage. The main systems used are:

Trough drinkers

13mm of trough space per duck (taking account of access to both sides where applicable).

Round hanging automatic drinkers (±45cm diameter).

0 to 42 days	- 1 / 100 ducks
43 days to depletion	- 1 / 200 ducks

Nipple drinkers (High flow rates)

0 – 126 days (Rearing)	- 10 ducks / nipple
127 days+ (Laying)	- 5 ducks / nipple

Swimming channels are sometimes made available from which the ducks will also drink.

In order to avoid wastage and poor litter conditions, drinkers should be checked twice per day to ensure they are working correctly and not leaking. Drinkers should be cleaned daily.

With nipple drinker systems it is important to avoid the build-up of biofilm within the nipple lines. Biofilm contains various pathogens that can affect the ducks. A routing sanitation programme should be implemented, using disinfectants that will effectively penetrate the biofilm and control any pathogens present.

Day-old to 7 Days of Age

During confinement in the brooding surround, water is best provided by automatic round hanging drinkers at the rate of 9.5mm of drinker lip per duckling or nipples at 10 duckling per nipple. In addition, water can be placed in feed trays for the first 4 hours after arrival at the farm. Du ring the first 2 days, water plus a vitamin / mineral preparation (from a reputable manufacturer) can be provided in chick fount drinkers in order to help the ducks recover from the stress of travelling. Chick founts would normally be withdrawn after 48 hours.

7 Days to 28 Days of Age

Drinkers should be gradually moved to one side of the pen or onto the drinker island if one is provided in the house. It is important that the drinkers are moved a short distance at a time, thereby allowing the ducks time to get used to the new position before moving them again. This is especially important when moving drinkers onto a raised drinker island which may take the ducks several days to get used to accessing.

28 Days to depletion

Clean all drinkers at least once each day and check that they are working correctly twice per day. When controlling the feed during the rearing period always check that the drinkers are working correctly before feeding. Ensure that drinkers are always positioned so that the ducks have access from all sides.

Swimming Channels

Where the ducks have access to a swimming channel either: ensure that there is a steady flow of water through the channel at all times, in which case empty and clean at least once each week; or if there is no water flow, empty and clean the channels each day.




The recommended Bodyweight Targets and Feeding Guide are shown in the tables on pages 12 & 13.

The feed types provided for parent ducks and the method of feeding are very important factors in determining the flock's subsequent performance. Feed intake is used during the rearing period to control bodyweight and hence sexual maturity. If not accurately controlled from the first day, egg production and hatchability will be adversely affected. To avoid food wastage pelleted feed should be used, at Cherry valley a single size of pellet of 3.22mm, cut to 10mm in length, is used for all types' ducks, of all ages.

Feed Rations

1 to 42 days of age - starter
43 days 126 days of age - developer
127 days until depletion - breeder

Details of all feed specifications can be found in the Cherry Valley Nutrition Manual.

Feeding Method

1 - 21 days

A fixed amount of feed is provided per duck per day. For the first 10 – 12 days the feed is placed in the feed trays, then at 10 to 12 days feed should start to be spread on the floor. This feed should initially be in spread lines so as to be easily seen by the duckling. At 16 days the feed trays can be removed and all feed spread on the floor. It is important that the feed be spread over a wide enough area to ensure that all ducks can eat at the same time, this will avoid stress and improve flock uniformity. Ducks will retrieve feed very well from the floor, even on deep straw litter. The floor area where feed is spread should be away from any wet areas.

21 days to 126 days

Feed is given once each day. The amount is adjusted, on a weekly basis, according to what the average bodyweight is, compared to the target bodyweight.

126 days to depletion

The feeding method is gradually changed from quantity restriction to timed restriction. Timed restriction allows the ducks free access to feed, in feeders, for a set number of hours each day. After 126 days it is not necessary to weigh ducks as their bodyweight does not significantly increase during the laying period. It is important to weigh a sample of eggs from the flock each week and to use this information to adjust the feeding times to ensure that egg size does not become too large. Feeding times will vary, normally between 6 and 12 hours, depending upon feed specification and climate.

Feeding Equipment

1 to 10/12 days

A set of scales and a bucket are required to measure out the feed required, for each pen, each day. The feed is then placed into feed trays; 1 tray per 100 ducks. (12.5mm of feeding space per duck).

Between 10/12 days and 126 days

The feed is measured out each day and, from approximately 16 days when the trays have been removed, spread on the floor of the pen. A set of scales and a bucket are therefore all the feeding equipment required during this stage. Scales and a catching frame are also required to collect ducks for sample weighing each week.

From 126 days until depletion

Provide a minimum feeding space of 16mm per duck. Feeders should be fitted with flaps to control access to the feed.

Feeding Programme

1 - 21 days

The first 21 days of life lay the foundation for growth and uniformity of bodyweight throughout the rearing period. Ducklings have a yolk sack that supplies their nutritional requirements for about 72 hours, but a long period of travel will deplete this resource. Ad-lib feeding up to a daily maximum feed allowance of 25 g/bird/day is recommended for the first week of life to ensure that all the ducklings have an equal opportunity to find food. Give the food, up to a maximum of 25 g/bird/day, in small quantities to keep it fresh and to stimulate the ducklings to eat. It is likely that the birds will eat less than 25 g/bird/day and the actual amount consumed will depend on their condition on arrival and the length of time they have travelled. Make sure that a record is kept of how much feed is used and if the ducklings do not eat all that they have been given, do not provide more.

- Multiply the specified feed rate, according to the age of the ducks, by the number of live ducks in the pen.
- Weigh out the quantity of feed for each pen separately.
- When it is clear that the ducklings are feeding normally after the first few days, place the feed in the feeders of each pen first thing in the morning of each day.

21 days until 126 days of age

During this period, the primary goal is to grow the ducks according to the bodyweight profile illustrated in the SM3 Rearing Chart. The consequences of poor bodyweight control will be seen in their effects on sexual maturity, the onset and persistence of lay, the number of eggs produced, their size, fertility and hatchability. The growth objectives can be achieved by controlling the daily feed allowance. Suggested feed allowances, based on the normal feed specification in temperate conditions, are given in the feeding guide.

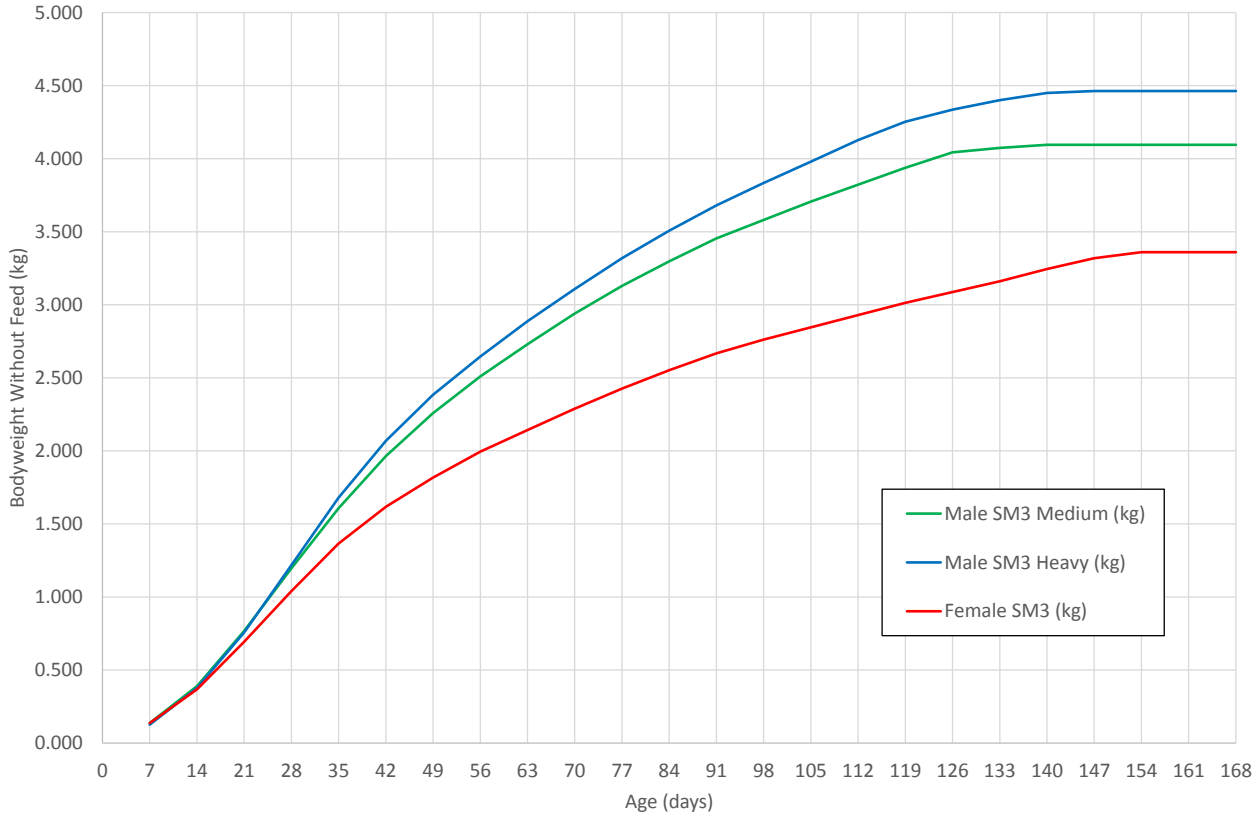
Make small weekly adjustments to the feed amount after 21 days of age. Holding the feed for more than 2 weeks is likely to damage the uniformity.

The degree of bodyweight control becomes progressively stronger as the birds get older, so they will become hungrier each day and eat their feed more quickly. The expected eating time is less than 1 hour once the flock has reached 35 days of age.

Change from Starter Feed to Developer Feed at 43 days of age.

Age (days)	Male	Female
1	Max 25	Max 25
2	Max 25	Max 25
3	Max 25	Max 25
4	Max 25	Max 25
5	Max 25	Max 25
6	Max 25	Max 25
7	Max 25	Max 25
8	32	28
9	38	33
10	45	39
11	53	45
12	59	52
13	64	57
14	69	61
15	75	65
16	80	70
17	85	74
18	90	78
19	95	83
20	100	87
21	105	91

Age (days)	Bodyweight Target During Rearing (kg)			Production Week	Feeding Guide During Rearing (g/bird/day)	
	Male SM3 Medium (kg)	Male SM3 Heavy (kg)	Female SM3 (kg)		Male (g)	Female (g)
7	0.137	0.126	0.137	1	Max 25	Max 25
14	0.389	0.378	0.368	2	50	45
21	0.767	0.756	0.693	3	90	80
28	1.197	1.218	1.040	4	130	115
35	1.607	1.680	1.365	5	135	119
42	1.964	2.069	1.617	6	140	123
49	2.258	2.384	1.817	7	145	127
56	2.510	2.646	1.995	8	150	131
63	2.730	2.888	2.142	9	155	135
70	2.940	3.108	2.289	10	160	139
77	3.129	3.318	2.426	11	165	143
84	3.297	3.507	2.552	12	170	147
91	3.455	3.696	2.667	13	175	151
98	3.581	3.833	2.762	14	180	155
105	3.707	3.980	2.846	15	185	159
112	3.822	4.127	2.930	16	190	163
119	3.938	4.253	3.014	17	195	167
126	4.043	4.295	3.087	18	200	171
133	4.074	4.358	3.161	19		
140	4.095	4.400	3.245	20		
147	4.095	4.463	3.318	21		
154	4.095	4.463	3.360	22		
161	4.095	4.463	3.360	23		
168	4.095	4.463	3.360	24		



Check Weighing

After 21 days the amount of feed provided is determined by comparing the average weight of the males and females with their target. The bodyweight targets are detailed on the "Rearing Chart" in the "Technical Data Sheet". Imprinting females should be disregarded at all stages of the weighing process and should be fed the same quantity of feed as the males they are housed with.

To compare with the target, a minimum of 50 ducks in each pen need to be individually weighed each week (in male pens ignore the imprinting females). It is crucial that the weighed ducks are a strictly random sample of the pen. This is best done by weighing the entire contents of a small, portable catching pen used in a corner of the pen.

The weighing procedure should start on Day 14. Weights must always be taken first thing in the morning before the ducks have been fed. After weighing is complete the ducks can be given their daily feed allocation. The male and female average weights should then be calculated and plotted on the body weight target graph. At 14 days the weighing exercise is carried out in order to provide a starting point for the bodyweight monitoring process – no changes in feeding levels are made as a result of this first weighing.

Following the 21 day weighing, when the average weights have been plotted on the "Rearing Chart", the future daily feeding level must be determined. The choice of feeding level is made according to the relationship between the actual average weight as compared to the target, as well as the trend that the actual bodyweight of the flock is taking.

For example:

- If the average bodyweight is low and/or not increasing at the same rate as the target line, feed the 21 day feeding level up to 28 days.
- If the average bodyweight is high and/or increasing at a faster rate than the target line, feed the 18 day feeding level up to 28 days.
- If the average bodyweight is on target and increasing at a similar rate to the target line, feed the 20 day feeding level up to 28 days.

Having determined the feeding level to be used, multiply that feeding level by the number of ducks in the pen to provide a total feed allocation for each day of the following week. Do this for each pen.

On the morning of the 28th day, before feeding, weigh another sample of the males and females from each pen. Calculate the average male and female bodyweights for the flock. Compare the average female weight with the female target and the average male weight with the male target on the SM3 Rearing Chart.

- If the average weight is low and not increasing as quickly as the target, then increase the daily feeding level by a reasonably large amount (10 to 15 grams / duck).
- If the average weight is on target and increasing at the same rate as the target, increase the feed by a small amount (5 grams / duck) to maintain the rate of growth.
- If the average weight is above target and/or increasing more quickly than target, first re-check the bodyweights and the daily amount of feed which was provided in the previous week. If all the information is correct, hold the existing feeding level for the following week.

It is always better to hold feeding levels constant to allow weights to gradually return to the target rather than to reduce them.

Continue to weigh samples of the males in the male pen(s) and the females in the female pen(s) every week up to 126 days of age. Adjust the feeding level after each weighing to ensure that the female bodyweight follows the female target and the male bodyweight follows the male target.

Note:

- Changes in ambient temperature will affect the duck's body temperature and change its nutritional requirement for body maintenance.
- Changes in feed quality, of either specification and/or pellet quality will affect the amount of nutrient taken in by the ducks and hence available for growth.
- Average bodyweights may fluctuate without any change in feeding level because of these factors.
- Strict control of the bodyweight, especially the female, is particularly important during the early stage of rearing.
- If some ducks are removed from a pen, the daily feed allocation must be adjusted to take into account the new number in the pen.

Assessing variation within a flock

Optimum performance is achieved with a flock of uniform bodyweight. A uniform flock is one in which 80% of the individual weights should fall within ±10% of the flock's average weight. The individual sample weights should be reviewed for uniformity each week. Correct feed distribution, to ensure that all ducks get the same access and hence the same amount of feed each day, is vital to achieving good uniformity within a flock. If uniformity becomes too variable the ducks should be individually weighed and segregated into heavy, average and light groups, and placed into separate pens. Feed quantities can then be adjusted to bring their average weights back to the target. Keep all variability records on file.

126 days to 182 days

Feeders should be introduced when the flock reaches 126 days of age and feeding gradually changed from quantity restriction to timed restriction. Provide a minimum of 16mm of feeding space per duck. The feeders must be fitted with flaps to give full control over the ducks' access to feed.

- Day 126, after distributing the normal amount of feed on the floor, open the feeders and allow free access to feed for 2 hours.
- Day 127 spread only half the allocation of feed on the floor of the pen, concentrating in the area of the feed hopper and allow free access to feed in the feeders for 2 hours.
- Day 128 stop floor feeding and provide feed from the feeders only.
- Day 128 – Day 133 allow free access for 2 hours / day.

The flock should remain on timed feeding until the end of lay.

Increase feeding times as follows:

Days	Feeders open
134-140	3 hours
141-147	4 hours
148-154	5 hours
155-161	6 hours
162-168	7 hours
169-175	8 hours
176-182	8 hours

Change the feed from the Developer to the Breeder ration at 126 days of age.

From 169 days hold the feeding time at 8 hours until egg weight begins to stabilize (this will happen after egg production has peaked). Then, if necessary, increase the feeding time in 1 hour increments to boost the average egg weight towards the target of 90-92 grams for both the Heavy and Medium strains. A 90 – 92 gram egg weight is required to achieve day old duckling of a good size and quality. Stop

increasing the feeding time just before the target weight is actually reached. If egg weight becomes too heavy hatchability will be reduced,

In open-sided houses, in hot climates without temperature control, it may be necessary to increase the feeding time earlier to ensure that the ducks come into production at the desired rate. From 182 days it can help to boost feed consumption by increasing the feeding time by up to a maximum of 2 hours per week up to 11 hours.

For example at 182 days continue to increase the daily feeding time to 10 hours and then by a further 1 hour to 11 hours of daily feed time at 187 days,

Try to ensure that the 11 hour period incorporates the coolest period of the day i.e. the early morning. Hold the feeding time at 11 hours until the egg weight begins to stabilize, then increase the feeding time to boost the egg weight towards the target of 90grams.

Notes:

- Starting at 50% production, a random sample of 100 eggs should be bulk weighed each week in order to estimate the average egg weight and to record how it is changing.
- Feeders should be allowed to run empty every week to provide the opportunity for thorough internal cleaning. During this period another hopper should be provided in the pen to ensure that there is no inadvertent additional feed restriction.
- Feed in mash form will lower intake, can be wasteful and is not recommended.

The period of light and dark which the ducks experience each day has a very important influence on sexual maturity and total egg production. Light stimulation and accurate bodyweight control must be properly combined to synchronise male and female sexual maturity and to achieve optimum performance.

Lighting Programme

The following 'Flat Light' programme is designed to work specifically with the bodyweight profiles provided in the Technical Data Sheet. By giving a standard 17 hours of light, from the second week of age, it is then possible to control sexual maturity by controlling the ducks bodyweight.

Age (Days)	Hours of Light/Day	Intensity of Light
1	23 hours	20 lux
2	22 hours	20 lux
3	21 hours	20 lux
4	20 hours	20 lux
5	19 hours	20 lux
6	18 hours	20 lux
7	17 hours	20 lux
8 until end	17 hours	20 lux

Under temperate and continental conditions the lighting period is normally managed so that the ducks receive light between 04:00 hours in the morning and 21:00 hours at night. The great majority of eggs will then be laid before 07:00 hours.

In tropical climates the programme can be adjusted and extended slightly to bring the lighting period forward with lights coming on at 02:00 hours and going off at 20:00 (18 hours/day). The objective of this change is to maximise the opportunity for feeding during the coolest part of the day by moving the laying period, and the post-lay eating opportunity, forward by 1 hour. Normally any adjustment is gradually made between 18 and 22 weeks of age to minimize the chance disruption to egg production.

Equipment

Incandescent, fluorescent or LED tubes and/or bulbs are suitable for lighting ducks. Whichever system is used it is important that the light is evenly distributed throughout the house.

In hot climates where open sided houses are used, natural light intensity will be much higher, it is usual to maintain relatively high light intensities within the houses, during the periods of artificial lighting. This ensures that the ducks receive the full level of light stimulation throughout the lighting period.

The lighting system should be controlled by a 24 hour programmable time-clock in each house. Clock settings should be checked weekly. Disruption in lighting periods will have a major effect on egg production and fertility. A stand-by generator should be linked to the lighting system to ensure minimum disruption in the event of main power failure.

The ventilation system must be capable of providing sufficient fresh air to maintain air quality, to replenish the oxygen used by the ducks and to remove noxious gasses and excess humidity; it must keep the ducks warm in cold weather and relatively cool when it is hot. Temperature should be maintained with the ducks' thermo-neutral zone, which is between 15°C and 25°C for post-brooding ducks, with ideal humidity in the range of 50-70% RH.

The following table shows the tolerable limits for air quality in duck houses. Exceeding these limits increases the risk, in particular, of damage to the ducks' respiratory system that may lead to ascites or other cardio vascular disease.

Temperature	15°C and 25°C post brooding
Humidity	50-70% Relative Humidity
Oxygen	More than 19%
Carbon Dioxide	Less than 0.3%
Carbon Monoxide	Less than 10 ppm
Ammonia	Less than 10 ppm
Inspirable Dust	Less than 3.4 mg/m^3

In controlled ventilation houses the amount of air needed to maintain these limits, (the minimum ventilation rate), can be estimated by reference to the ducks' bodyweight. 0.7 m^3 of air per hour per kilogram of bodyweight is a reasonable approximation. The minimum ventilation rate must be increased as the ducks grow and if the air quality deteriorates.

The following table indicates the amount of air needed by ducks at different bodyweight (based on 25 breeding units of 110 females and 25 males, a total of 3,375 ducks).

The amount of air needed to prevent heat stress in hot weather is the maximum ventilation rate, which is determined by the heat output of the ducks and an assessment of the risk of heat stress. In temperate

Age	Average Bodyweight (males and females)	Minimum Ventilation Requirement (m^3 of air/hour for 3,375 ducks, males and females)
Week 1	128 g	303
Week 6	1.617 kg	3,650
Week 12	2.598 kg	6,139
Week 18	3.153 kg	7,449
Week 24	3.944 kg	8,019

conditions, a ventilation system capable of delivering 10 times the minimum rate will provide acceptable control of heat stress. In the hot conditions of the tropics, the multiplication factor may need to be 20 times the minimum ventilation rate.

- Minimum Ventilation Rate - 0.7 m^3 of air per hour per kilogram of bodyweight
- Maximum Ventilation Rate, Temperate Climate – 7.0 m^3 of air per hour per kilogram of bodyweight
- Maximum Ventilation Rate, Tropical Climate – 14.0 m^3 of air per hour per kilogram of bodyweight

There are many different concepts of ventilation design for poultry houses, ranging from low-tech, naturally ventilated buildings to sophisticated, controlled environment systems. Any system should be capable of delivering the amounts of air described above and maintaining the quality of the environment. The following principles for air distribution apply to all systems.

- Airspeed at duck level should be less than 1 m/s for day-old ducklings and during brooding.
- Cold air must not be allowed to fall on the floor.
- Increasing airspeed up to 3.0 m/s for ducks in hot conditions will help to control heat stress.

Tunnel ventilation and evaporative cooling systems are very effective tools for the control of heat stress in hot climates. Advice concerning the design and management of such systems are available from the Cherry Valley Technical Desk.

A clean, dry, friable material such as wood shavings, rice hulls or straw is required for use as litter on the floor of the house. The quality of the litter is very important in maintaining the health of the ducks and the quality of the hatching eggs produced.

Avoid the use of mouldy material. Ducks are very susceptible to aspergillosis, and the spores of the Aspergillus spp. are found in litter material that has been allowed to become damp, producing ideal conditions for the fungus to grow. Aspergillosis will cause egg production to drop and may increase mortality in parent flocks. Heavily contaminated eggs can spread the infection to the hatchery, where it will reduce hatchability and damage the quality of the day-old ducklings.

The frequency with which new litter must be spread on the floor of the house will depend on the age of the stock, the climate, and the type of drinking system in use. Under normal circumstances a thin covering of fresh litter would be spread on the floor of the house at least:

Nursery: Three times per week.
Rearing: Three times per week.
Laying: Every day.

Special attention to the quality of nest box litter is important. Eggs that are soiled in the nest box, or on the pen floor, invite infection and will hatch at a much lower level than clean eggs. Add clean litter to nest boxes daily. This is better done later in the day, as there is then less opportunity for the nest to become dirty before it is used for egg laying the following morning. If any nests become particularly wet or dirty during the laying period, remove all the existing nest box litter and replace with new clean material.

Nest Boxes

Install the nest boxes in the breeding pens by 140 days of age. They should be positioned around the perimeter of the house, away from the drinkers and wet areas, at a minimum rate of one nest box cubicle per 3 females. Initially, place 10cms of dry clean litter in each cubicle, and then add more litter on a daily basis to keep them clean and dry. As the litter builds up day-by-day the nest boxes will gradually become buried, so it is important to lift them to the top of the litter once each week.

Egg Production

Small numbers of eggs will start to appear in the 21st or 22nd week, but 'point of lay' is considered to be the time when the flock reaches 5% production. At the onset of lay a high proportion of eggs will be laid outside the nest boxes. This will change quickly as egg production increases.

It is normal to see a high percentage of large and small eggs at the onset of lay. This is a function of immaturity and soon passes as egg production increases. A typical example of the percentages involved is:

Weeks of Age	% large & small eggs
25	15.0
26	8.0
27	5.5
28	2.5
29	2.0
30	1.3
31	1.1
32	0.8

Egg Collection

Egg collection should be the first job of the day. The eggs should remain in the nests for as short a period as possible to reduce the risk of them becoming dirty and infected. Avoid disturbing the ducks while they are laying eggs and collect the eggs after they have finished. In normal conditions, it is not necessary to make more than one collection, because ducks have a concentrated laying pattern. Ducks habitually bury their eggs in the litter, so boxes with clean, friable litter are preferred by laying ducks.

To avoid cracking eggs and the spread of bacteria from shell to shell, eggs should be collected on clean plastic egg trays that support each egg. The eggs should be placed on the trays pointed end down and the trays can be put into a wire frame for transport and washing.

The egg collector should work systematically around each pen following the same route every day, sifting through the litter in each nest box and in the corners of the pen to find all the eggs. Ducks are very good at hiding eggs, so a thorough search is essential. When all the eggs have been collected, the total number should be recorded on the pen record card. If the total number of eggs collected is more than 10% less than the previous day's total, the egg collector should go around the pen again checking for eggs that may have been missed. If the number is still low after this check, the cause of the drop in production, which could include feed, water, light or disease problems, must be investigated immediately.

When egg collection for each house is finished, transport the eggs to the egg room for washing. Always protect the eggs from rain, extremes of climate and direct sunlight.

Egg Weight

Weigh a sample of 100 eggs from each breeding flock every week. The weekly trend in egg weight is an important component of decisions concerning feed allowance. Adjust the feeding times during production to achieve target egg weight, as below.

Target relative to climate	
Temperate	Hot
90 - 92g	86-88g

It is normal practice to wash duck eggs, because they are generally laid at floor level and tend to be dirty and contaminated with bacteria, even when the nest box hygiene is good and the eggs look clean. High levels of hatchability can be achieved with clean duck eggs, but if the eggs are not washed properly it may be reduced by up to 15% and hatches may include large numbers of rotten and contaminated eggs (bangers) resulting in lower hatchability and poor quality chicks.

Egg Washing Equipment

Various systems are available for egg washing. They range from simple 'Rotamaid' basket washers to sophisticated and carefully controlled machines like those developed by MST. In line egg washing systems with automatic control of water temperature and chemical addition are available that will wash and dry eggs on incubator trays.

The system designed and operated at Cherry Valley is a 'Cascade' batch washer with rotors that circulate the water producing a Jacuzzi effect that lifts dirt from the eggshells. Eggs are washed on-farm, immediately after collection on Cherry Valley farms, but the system has been adapted to fit many different circumstances around the World.

System A - Cuticle-On Egg Washing

The conventional method of washing eggs is to remove the contamination leaving the eggs cuticle intact. There are various procedures that use different detergents, sanitisers and equipment, all of which can produce good results; the system used at Cherry Valley is described below.

System B - Cuticle-Off Egg Washing

The egg shell cuticle is the protein rich coating that covers the surface of the shell. The cuticle of duck eggs is thick; to protect the developing embryo from the damp conditions in which the eggs are naturally hatched. Removing the cuticle allows increased gas exchange and water loss through the eggshell during incubation and the technique has been used to improve hatchability at Cherry Valley. Removing the cuticle, however, does expose the embryo to greater risk of infection and care must be taken with cuticle-off eggs to limit the risk of condensation forming on the eggshell.

System A - Cherry Valley Egg Washing Procedure – Cuticle-On

- Washing Equipment - Cascade Batch Egg Wash Machine - 540 litre capacity for 400 eggs per batch
- Washing Temperature - 38°C
- Washing Time - 7 minutes
- Washing Chemicals - Washing Soda (sodium carbonate, Na_2CO_3)
- Amount of Chemicals - 2.75 kg of Washing Soda

Procedure

Leave the washing machine full of clean water overnight. On the morning of the wash, heat the water to 38°C, then add 2.75 kg of washing soda and switch on the circulation mechanism for 1 minute to mix thoroughly.

After checking and removing any large, small, cracked or very dirty eggs (normally less than 2% of the total collected), place a cover over each holder and lift the first batch of eggs into the washing machine.

Switch on the circulation mechanism and the timer, and leave to wash for 7 minutes. While the first batch of eggs are in the machine, check the next batch and remove any that are not suitable for incubation.

As soon as the washing time is complete, switch off the circulation mechanism, remove the washed eggs and place the next batch of eggs into the machine. Re-set the timer and wash the eggs. Allow the washed eggs to dry before placing them into the egg store. Continue this routine until all the eggs are clean. When the washing is finished, drain the machine, then refill it with clean water and run the circulation for 2 minutes to rinse the tank.

Key Points

The cuticle must remain intact. A sanitiser may be added to the wash water if the eggs are very dirty, but care must be taken to ensure that it does not remove the cuticle.

Add washing soda during the procedure if the eggs do not come out clean. Extra chemicals may be needed if a large number of eggs are washed, or if the eggs are very dirty.

System B - Cherry Valley Egg Washing Procedure – Cuticle-Off

- Washing Equipment - Cascade Batch Egg Wash Machine – 540 litre capacity for 400 eggs per batch. Rinse tank, 150 litre capacity for 100 eggs per rinse.
- Washing Temperature - Wash - 38°C / Rinse - 48°C
- Washing Time - 7 minutes
- Rinsing Time - 5 seconds
- Washing Chemicals - 12.5% Sodium Hypochlorite solution, Washing Soda (sodium carbonate, Na_2CO_3)
- Amount of Chemicals - Sufficient to provide a minimum of 1300 ppm of available chlorine and a pH of 10.5 to 11.5; normally 5 litres initial addition and 400 ml top-up per batch cycle of hypochlorite solution and 2.75 kg of washing soda

Procedure

Leave the washing machine full of clean water overnight. On the morning of the wash, heat the water to 38°C, then add 5 litres of hypochlorite solution (12.5% concentration) and 2.75 kg of washing soda and switch on the circulation mechanism for 1 minute to mix thoroughly.

Heat the water in the rinse tank to 48°C. The purpose of the rinse is to remove excess chlorine from the eggshell, making the eggs safer to handle.

After checking and removing any large, small, cracked or very dirty eggs (normally less than 2% of the total collected), place a holder cover over each holder and lift the first batch of eggs into the washing machine.

Switch on the circulation mechanism and the timer, and leave to wash for 7 minutes. While the first batch of eggs are in the machine, check the next batch and remove any that are not suitable for incubation.

As soon as the washing time is complete, switch off the circulation mechanism, remove the washed eggs and rinse them immediately. Rinsing should only take 5 seconds per stack, it is enough to dip each stack in the rinse tank and then lift it out straight away. It is important to ensure that the rinse water is always hotter than the wash water. If warm eggs are dipped in cold water the temperature differential will result in the contents of the egg shrinking and drawing rinse water being drawn through the shell.

Top up the chlorine level in the wash water by adding 400 ml of hypochlorite solution and place the next batch of eggs into the machine. Re-set the timer and wash the eggs. Allow the washed and rinsed eggs to dry before placing them into the egg store. Continue this routine until all the eggs are clean. When the washing is finished, drain the machine, then refill it with clean water and run the circulation for 2 minutes to rinse the tank and leave it full ready for the following day.

Key Points

Use a high level of chlorine to remove the cuticle successfully. The minimum level should be 1,300 ppm, as a consequence of toping up, the level normally starts at 1,400 ppm and rises to about 1,800 ppm at the end of the process, depending on the cleanliness of the eggs. Levels of up to 3,000 ppm of chlorine have been tested at Cherry Valley without a detrimental effect on hatchability.

Check the chlorine levels in the wash water at the start and finish of washing at least once per monthly.

Chlorine levels in the hypochlorite stock solution can vary considerably between different suppliers and during storage, so it may be necessary to adjust the hypochlorite additions. If in doubt, increase the amount of hypochlorite used.

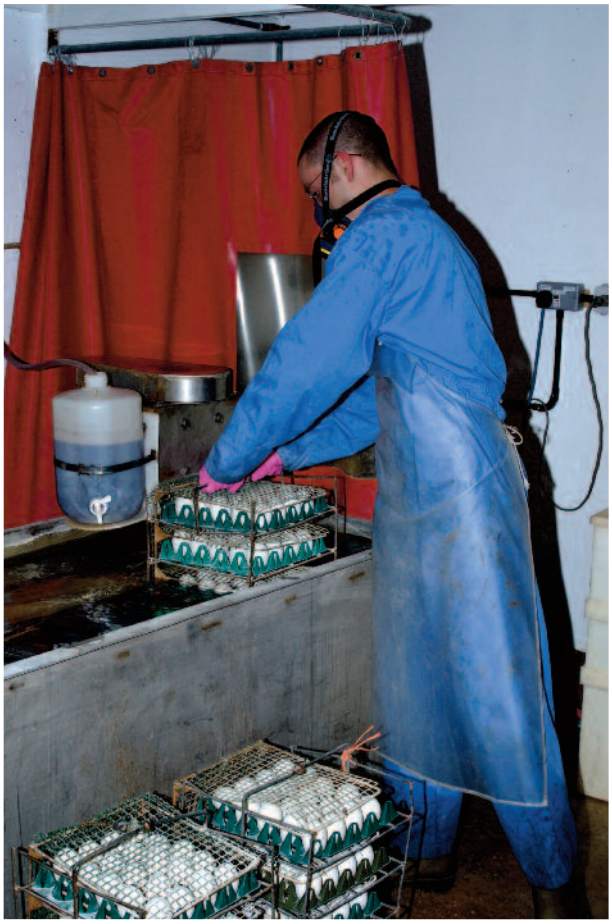
Eggs that have had the protective cuticle removed are very vulnerable to bacterial infection if they are badly handled.

Do not allow cuticle-off washed eggs to get wet at any time after washing. It is especially important that condensation does not form on the shells during storage.

Incubate cuticle-off washed eggs at higher humidity to maintain the correct egg weight loss (11-13% from setting to transfer). At Cherry Valley the wet bulb temperature during the incubation period has been increased to 90.0°F (32°C).

Health & Safety Precautions

Take great care when handling sodium hypochlorite solutions, they are highly corrosive and dangerous to human health. Use only in a well-ventilated room with provision of appropriate protective clothing. Always follow manufactures precautions and recommendations.



Put the eggs in a temperature-controlled store immediately after washing. To achieve the best hatchability the proper conditions for egg storage should be maintained throughout the year, but they are especially important when the weather is extremely hot or cold.

Storage Temperature

For the best hatchability, keep the egg store at an average temperature between 13°C and 15°C. Provision should be made for cooling in hot weather and for heating in cold weather. Make sure that the heating and cooling systems do not blow hot or cold air directly onto the eggs and make provision for air mixing.

It is essential, especially if the eggs are washed 'cuticle-off', that condensation is never allowed to form on the egg shell. It will result in significant bacterial contamination, leading to low hatchability and poor duckling quality. Treat the egg stores as if they are part of a 'cool-chain'; do not put cold eggs into a warm, humid environment. Remember that the truck transporting eggs to the hatchery is part of the process, so it should also have climate control.

If it is not possible to adopt a 'cool-chain' approach, perhaps in hot climates, the egg store temperature can be increased to 18°C without significant loss of hatchability. At this temperature the risk of condensation on the eggs is limited.

Storage Humidity

Maintain the relative humidity in the egg store between 75% and 80% in order to reduce egg weight loss by evaporation. This is especially important in cold or dry climates.

Storage time

The optimum storage period for hatching eggs is between 2 and 4 days. Avoid storage periods of more than 7 days, because hatchability will fall at an increasing rate after this time.

Storage Hygiene

Keep the egg store clean, tidy and free of vermin to minimise the risk of cross-contamination. Wash and disinfect the egg store every week, taking care to keep the eggs dry.

Accurate and complete record keeping is key to successful flock management. It is important to understand how flock performance compares with Key Performance Indicators (KPI) and problem solving is impossible without good information.

Rearing Records

The key information is the average male and female bodyweight, feeding levels and mortality and culls. Feeding, mortality and culling data must be recorded every day and the ducks should be weighed every week.

Laying Records

Egg production, mortality and culls, average egg weight and feeding time as well as the results of hatching are all important. Egg production, feeding, mortality and culling data must be recorded every day and egg weight should be recorded at least weekly.

Hatching Records

The number of eggs set, clear eggs removed during incubation and the number of chicks hatched will be needed for every hatch to maintain reliable hatchery records. Regular hatch debris breakout provides a valuable insight to the incubation process. Hatchery results must be reported to the manager responsible for the breeding flocks.

Recording Systems

Assessing the performance of breeding stock begins on rearing and laying farms. Record cards located in each pen or house are the means of collecting the data and allow stockmen to make an immediate assessment of a flock's progress. Graphing the performance data allows easy review of historical performance and an outline prediction of what may happen to performance in the future. Computer based recording systems bring an added level of sophistication and allow quick and easy compilation of results. The Cherry Valley Technical Desk can provide a range of pen record cards and standard graphs that will provide the basic requirements.

It is essential that everyone in any organisation has the same understanding of what should be recorded for each item.

Troubleshooting Rearing Bodyweight Management

The following graph is based on real Cherry Valley Farms rearing flock data and is used to illustrate the following points:

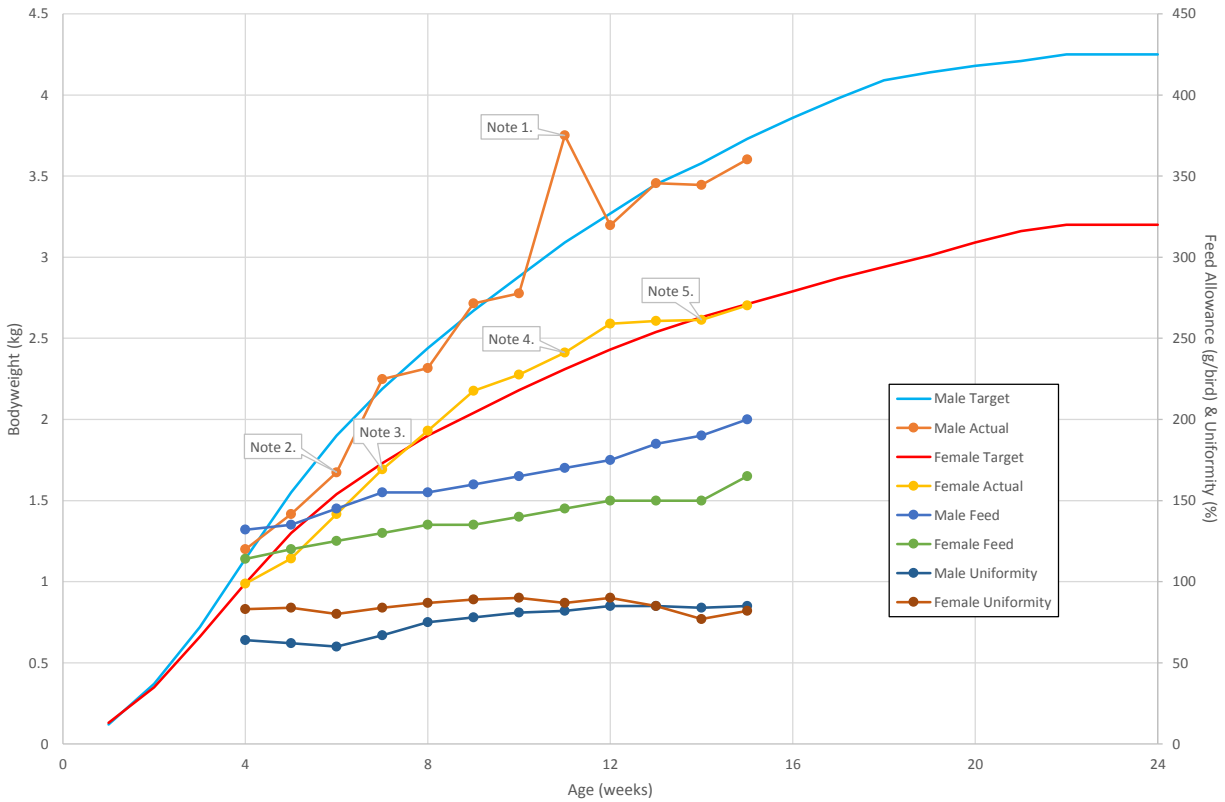
Note 1. This point looks like a mistake has been made when weighing the ducks or calculating the average bodyweight. The correct action is to go back to the flock and weigh the ducks again.

Note 2 & 3. The correct action is being taken. Although the bodyweight is behind target, feed allowance has been increased carefully and uniformity is improving or stable. The correct action is to continue making similar adjustments to the feed allowance so that the bodyweight follows the curve.

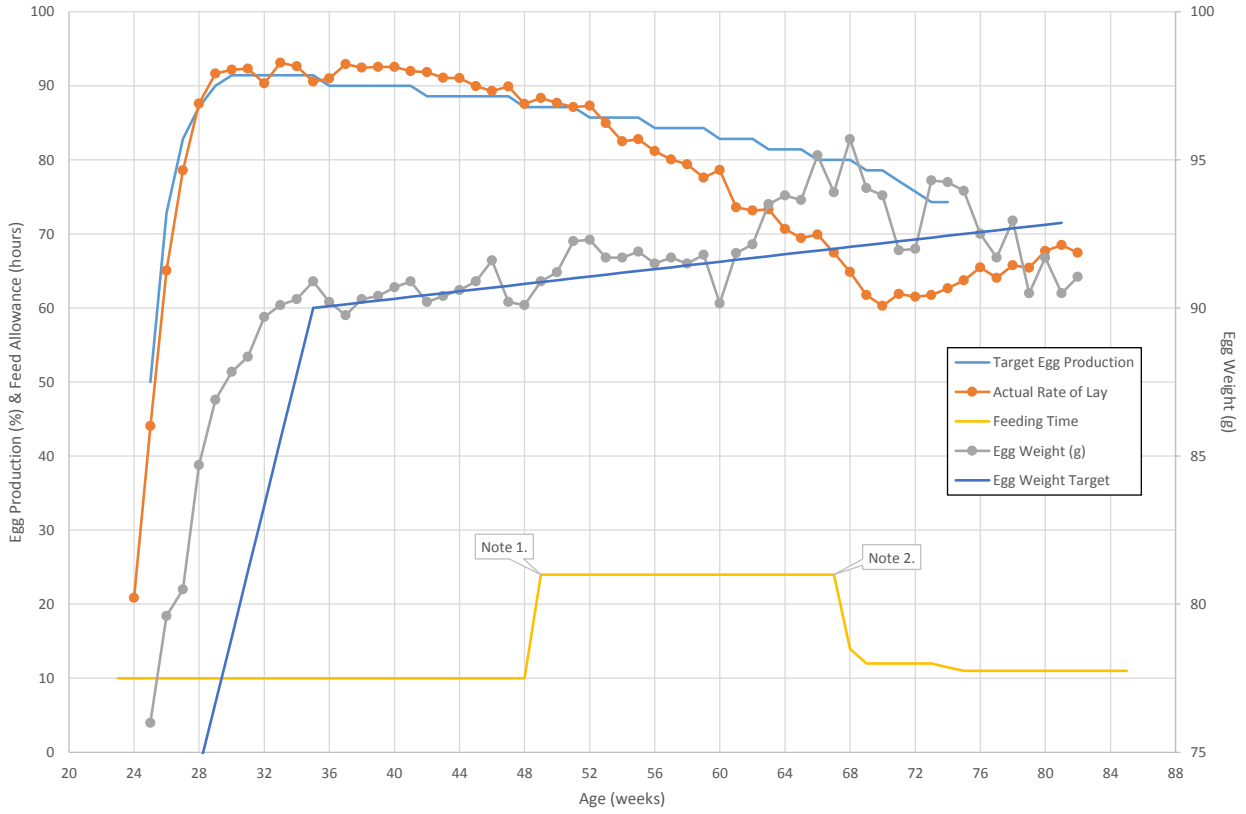
Note 4. Bodyweight for the females is over target, but seems to be under control. The correct action is to continue with the increases in feed allowance and allow the bodyweight to follow parallel to the curve.

Note 5. This point shows the effect of withholding increases in the feed allowance. The female bodyweight has been forced back to the curve, but at the expense of flock uniformity, which has fallen significantly. The situation can be recovered by increasing the feed allowance, but if this happens towards the end of rearing, it is likely that the onset of production will be delayed and egg production may be affected.

Troubleshooting - Rearing Bodyweight Management



Troubleshooting - Rearing Bodyweight Management



Troubleshooting Egg Production and Egg Weight

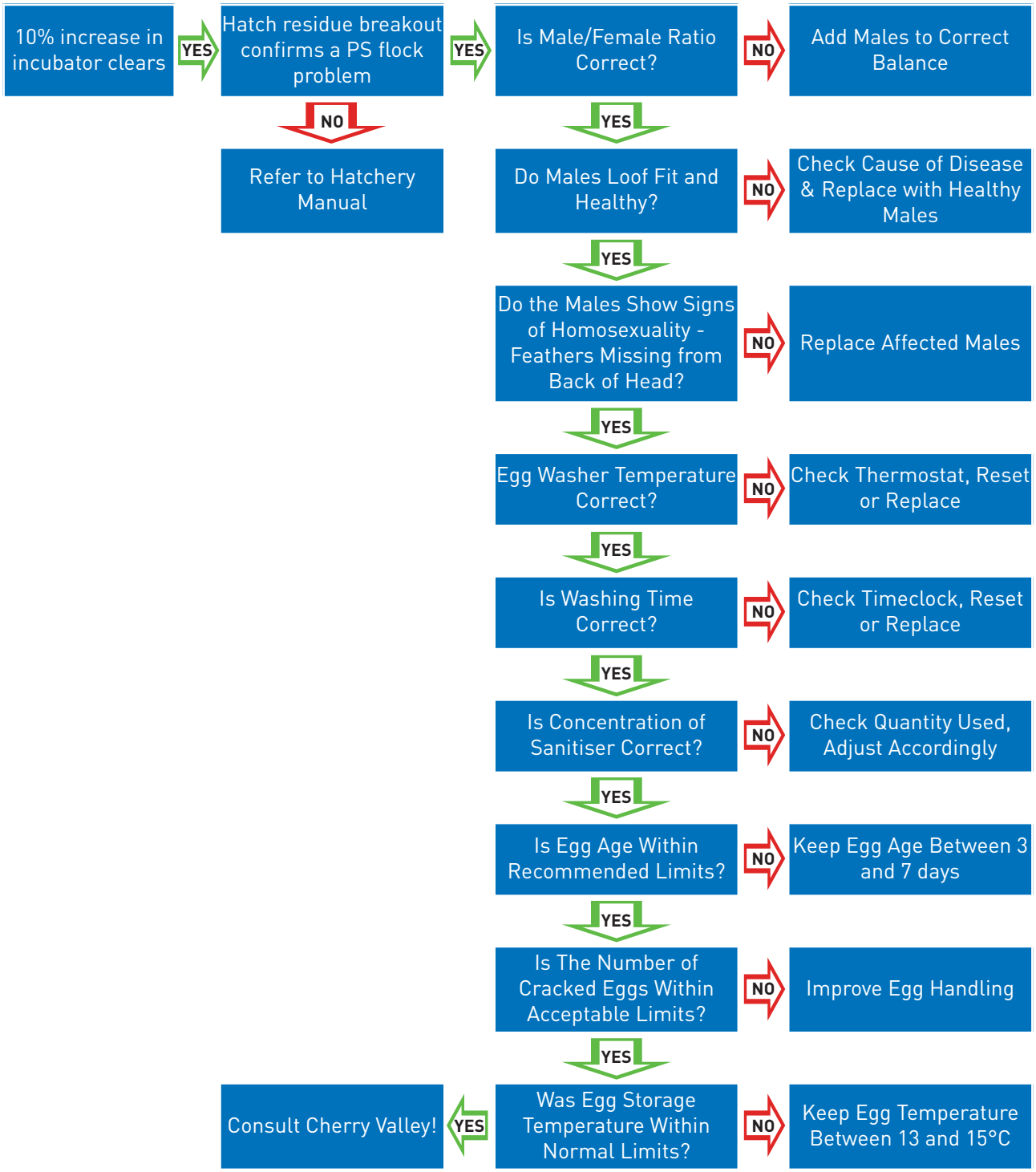
Feeding allowance during the laying period should be adjusted by monitoring changes in appetite and egg weight. The graph above is based on actual flock data and is used to illustrate the following points:

Note 1. Although production was according to standard and egg weight was stable, the flock was given 24 hours access to feed as there was concern regarding its appetite during the hot weather. The effect of this mistake can be seen in following weeks. The typical pattern is for egg weight to begin to rise and production to fall. The likely cause of this pattern is that overconsumption of feed increases egg size and the length of time that it takes for the ducks to form an egg increases and leads to individual ducks skipping one days' production.

Note 2. Reducing the access to feed starts to bring egg weight back under control and egg production begins to recover. The correct approach is to make such adjustments as gradually as possible so that disturbance to the flock is kept to a minimum.

Troubleshooting Fertility

Fertility is a complex characteristic that involves interactions between duck behaviour, egg management and incubation practice. Managers often quote fertility figures that are derived, in fact, from the number of clear eggs found during incubation. These figures are not true fertility, so if the number of clear eggs increases, a hatch residue breakout should be carried out to confirm that the embryos have not died in the early stages of incubation. Following is a decision tree designed to help with the diagnosis of fertility problems.



2 Weeks Prior to Arrival

- House cleaning and disinfection, and fumigation.
- Check and ensure availability of necessary vaccines.
- Check with airline and/or handling agent that all necessary documentation for arrival and clearance of stock is in place.

2 Days Prior to Arrival

- Set up any brooder surrounds, heating, drinking and feeding equipment.
- Ensure feed and litter are in place.
- Heat the house up to brooding temperature.
- Fill water barrels to ensure ambient temperature at placement.
- Check operation of all equipment.

Day of Arrival

- Thoroughly flush drinking system.
- Fill and place any chick founts.
- Set lighting time clock to provide 23 hours of light.
- Check and adjust brooder temperatures.

Arrival of Stock

- If DVH vaccination is necessary, vaccinate and hold in boxes for 8 – 12 hours until the vaccine has had the opportunity to produce initial immunity. Details of the recommended procedures are available separately from the Technical Dept.
- Count the ducks into the brooding area. Count males first, then allocate 1 female per 4.5 males. Then place the majority of the females into separate brooding areas.
- Fill the feed trays with a 12mm depth of water.
- Record any dead ducks according to sex.
- Allow the ducks to settle and drink. Watch the ducks, any which show no signs of interest in water should have their beaks dipped in the water to encourage them to drink.
- Refill to 12mm the water in the feed trays for the first 4 hours after placing the duckling, thereby allowing the ducks time to rehydrate before feeding.

Arrival + 4 Hours (Day 1)

- Calculate the quantity of feed per brooder area by multiplying the Day 1 feeding level, from the "21 Day Feeding Schedule", by the number of dayolds in the area. Use the feeding level appropriate to climate.
- Weigh out the feed and place it into the feed trays of each surround once they have been emptied of water.
- Check the spread of the ducks within the brooding area once they have settled. Adjust the brooder temperature accordingly.

Days 2 to 7

- Calculate the feed for each brooding area using the relevant daily feeding level.
- Clean the drinkers daily.
- Start to reduce the brooder temperature according to the profile in the 'Heat' section of this manual.
- From 2 days increase the radius of any brooder surrounds each day, providing up to 0.2m2 /duck at 7 days.
- Adjust the lighting time clock by 1 hour per day gradually reducing the daily photo-period from 23 hours to 17 hours by 7 days of age (normally running between 0400 hours to 2100 hours).
- Spread a small quantity of clean dry litter as necessary to keep the area dry and clean.
- Record all losses.

Days 7 to 21

- Continue to feed each pen according to the "21 Day Feeding Schedule". Gradually change from tray feeding to floor feeding.
- Continue to reduce brooder temperature according to the profile. Remove any brooders once ambient temperature has been achieved.
- At 14 days, before feeding, weigh a sample of 50 (minimum) ducks in each of the male and female pens. Calculate and record the average weights on the "Rearing Chart".
- Clean drinkers daily.
- Maintain 17 hours of light each day.
- Maintain floor condition by the addition of litter as necessary.
- Record losses.

Days 21 to 28

- Prior to feeding on the morning of the 21st day, weigh a sample of the males and females, calculate their average weight and record it on the "Rearing Chart". Review the 14 and 21 day weighing results to decide on the feeding level to be applied from 22 to 28 days.
- Increase the space allowance to 0.45 m2 / duck by spreading the ducks throughout the rearing house and allocating them to their rearing pens. Maintain a mating ratio of 1 female per 4.5 males in the male pen(s). Keep females in separate pens.
- Clean drinkers daily.
- Maintain good floor condition by routine addition of fresh litter.
- Record all losses

28 days to 126 days

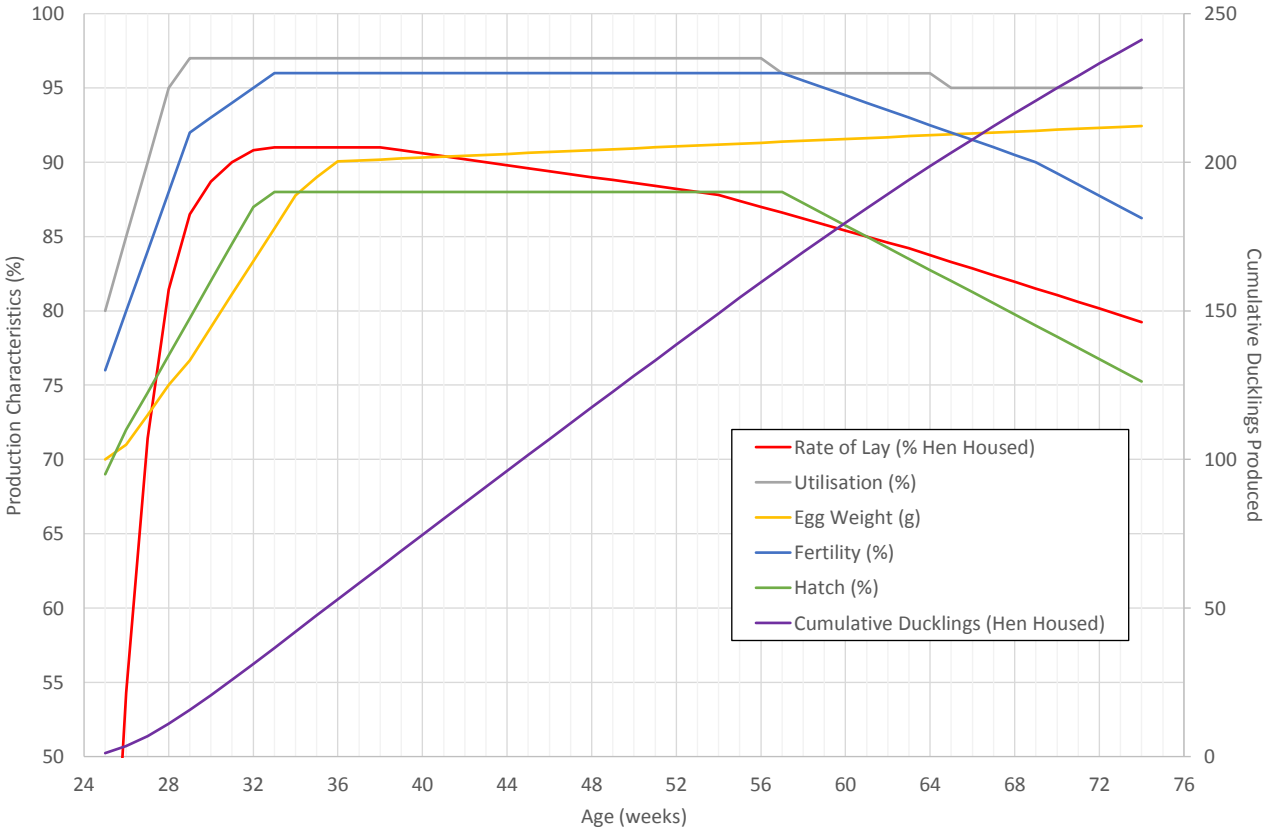
- Weigh a 10% sample of males in the male pen(s) and females in the female pen(s) each week. Compare their average weights with the targets on the "Rearing Chart" and adjust the feeding level to encourage the weight to follow the target.
- Weigh/measure out the feed for each pen and spread it over the floor of the pen each day. Ensure all ducks have an equal opportunity to feed.
- Change from Starter feed to Developer feed at 42 days.
- Carry out any vaccinations as per the vaccine manufacturer's programme. The Technical Desk can provide additional guidance if required.
- Clean drinkers daily.
- Maintain 17 hours of light each day.
- Litter the floor area as necessary to keep the ducks dry and clean.
- Record average weights, feeding levels, mortality and culls.
- Check and maintain pen fences regularly. Any movement of the ducks between pens will affect bodyweight control.

At 126 days

- Weigh ducks for the last time.
- Place feed hoppers in the pens.
- Switch from floor feeding to hopper feeding on the basis of 2 hours access to feed per day and increase as recommended in the 'Feeding SM3 Parent Ducks' section of this handbook.

126 to 168 days

- Increase the feeding time each week in order to achieve 8 hours feeding at 23 weeks of age. Then hold at 8 hours per day.
- Change from Developer to Breeder feed at 126 days of age.
- Select the ducks and mate up to establish the breeding pens at 126 days. Discard any poor quality ducks.
- Provide 0.55 m^2 per duck.
- Equally spread the females between the available pens and then allocate 1 male to every 5 females in each pen.
- Maintain 17 hours of light. Check the time clocks each week.
- Install nest boxes at 1 nest per 3 females at 126 - 133 days.
- Litter nests and floor every day in order to maintain clean conditions.
- Maintain a consistent high level of management and stockmanship. Avoid disturbances and/or disruptions in any of the programmes. Remember that all changes to the ducks' routine constitutes stress, always be mindful of this and minimize stress of any description.
- Record losses and abnormal events.



175 days to Depletion

- Collect and wash eggs first thing each day.
- Maintain 8 hours of feeding until egg weight begins to stabilise then adjust feeding time in order to move egg weight to up 90 grams.
- Maintain 17 hours of light.
- Clean drinkers daily.
- Litter nests and floor daily. Record egg production, mortality/ culls, average egg weight and feeding time.

Age at Week Start (days)	Production Week	Week of Lay	Rate of Lay (% Hen Housed)	Total Eggs per Week (Hen Housed)	Utilisation (%)	Hatching Eggs per week (hen housed)	Egg Weight (g)	Fertility (%)	Hatch (%)	Ducklings per week (Hen Housed)
168	25	1	30.00	2.10	80.00	1.68	70.00	76.00	69.00	1.16
175	26	2	54.29	3.80	85.00	3.23	71.00	80.00	72.00	2.33
182	27	3	71.43	5.00	90.00	4.50	73.00	84.00	74.50	3.35
189	28	4	81.43	5.70	95.00	5.42	75.00	88.00	77.00	4.17
196	29	5	86.50	6.06	97.00	5.89	76.67	92.00	79.50	4.68
203	30	6	88.70	6.21	97.00	6.01	78.89	93.00	82.00	4.93
210	31	7	90.00	6.30	97.00	6.11	81.11	94.00	84.50	5.16
217	32	8	90.80	6.36	97.00	6.17	83.33	95.00	87.00	5.36
224	33	9	91.00	6.37	97.00	6.18	85.56	96.00	88.00	5.44
231	34	10	91.00	6.37	97.00	6.18	87.78	96.00	88.00	5.44
238	35	11	91.00	6.37	97.00	6.18	89.00	96.00	88.00	5.44
245	36	12	91.00	6.37	97.00	6.18	90.06	96.00	88.00	5.44
252	37	13	91.00	6.37	97.00	6.18	90.13	96.00	88.00	5.44
259	38	14	91.00	6.37	97.00	6.18	90.19	96.00	88.00	5.44
266	39	15	90.80	6.36	97.00	6.17	90.25	96.00	88.00	5.43
273	40	16	90.60	6.34	97.00	6.15	90.31	96.00	88.00	5.41
280	41	17	90.40	6.33	97.00	6.14	90.38	96.00	88.00	5.40
287	42	18	90.20	6.31	97.00	6.12	90.44	96.00	88.00	5.39
294	43	19	90.00	6.30	97.00	6.11	90.50	96.00	88.00	5.38
301	44	20	89.80	6.29	97.00	6.10	90.56	96.00	88.00	5.37
308	45	21	89.60	6.27	97.00	6.08	90.63	96.00	88.00	5.35
315	46	22	89.40	6.26	97.00	6.07	90.69	96.00	88.00	5.34
322	47	23	89.20	6.24	97.00	6.06	90.75	96.00	88.00	5.33
329	48	24	89.00	6.23	97.00	6.04	90.81	96.00	88.00	5.32
336	49	25	88.80	6.22	97.00	6.03	90.88	96.00	88.00	5.31
343	50	26	88.60	6.20	97.00	6.02	90.94	96.00	88.00	5.29
350	51	27	88.40	6.19	97.00	6.00	91.00	96.00	88.00	5.28
357	52	28	88.20	6.17	97.00	5.99	91.06	96.00	88.00	5.27
364	53	29	88.00	6.16	97.00	5.98	91.13	96.00	88.00	5.26
371	54	30	87.80	6.15	97.00	5.96	91.19	96.00	88.00	5.25
378	55	31	87.40	6.12	97.00	5.93	91.25	96.00	88.00	5.22
385	56	32	87.00	6.09	97.00	5.91	91.31	96.00	88.00	5.20
392	57	33	86.60	6.06	96.00	5.82	91.38	96.00	88.00	5.12
399	58	34	86.20	6.03	96.00	5.79	91.44	95.50	87.25	5.05
406	59	35	85.80	6.01	96.00	5.77	91.50	95.00	86.50	4.99
413	60	36	85.40	5.98	96.00	5.74	91.56	94.50	85.75	4.92
420	61	37	85.00	5.95	96.00	5.71	91.63	94.00	85.00	4.86
427	62	38	84.60	5.92	96.00	5.69	91.69	93.50	84.25	4.79
434	63	39	84.20	5.89	96.00	5.66	91.75	93.00	83.50	4.72
441	64	40	83.75	5.86	96.00	5.63	91.81	92.50	82.75	4.66
448	65	41	83.30	5.83	95.00	5.54	91.88	92.00	82.00	4.54
455	66	42	82.85	5.80	95.00	5.51	91.94	91.50	81.25	4.48
462	67	43	82.40	5.77	95.00	5.48	92.00	91.00	80.50	4.41
469	68	44	81.95	5.74	95.00	5.45	92.06	90.50	79.75	4.35
476	69	45	81.50	5.70	95.00	5.42	92.13	90.00	79.00	4.28
483	70	46	81.05	5.67	95.00	5.39	92.19	89.25	78.25	4.22
490	71	47	80.60	5.64	95.00	5.36	92.25	88.50	77.50	4.15
497	72	48	80.15	5.61	95.00	5.33	92.31	87.75	76.75	4.09
504	73	49	79.70	5.58	95.00	5.30	92.38	87.00	76.00	4.03
511	74	50	79.25	5.55	95.00	5.27	92.44	86.25	75.25	3.97
Cumulative for 50 weeks in production:				**296**	**95**	**284**		**93**	**84**	**241**

Age	
Day-Old	Ducklings are considered to be day-old when they arrive on the rearing farm. This means that at the time of arrival they will be zero days old, the first day, or part day will be Production Day One and they will be one day old on the following morning.
Production Week 1	Many companies have accounting weeks that may run, for example, from Monday to Sunday (7 days). To avoid confusion it is recommended that the fraction of the first week following delivery be regarded as Production Week Zero. In this way the ducklings will be 7 days (1 week) old during Production Week 1.
Point of Lay (POL)	The flock reaches Point-of-Lay when it has finished rearing and starts production. At this time the cost of rearing will be capitalised, to be repaid from egg production. At Cherry Valley the flock is regarded as Point-of-Lay when it reaches 168 days, 24 weeks of age.
Hatch	
Fertility	The percentage of fertile eggs produced by a parent flock, recorded by careful examination of clear eggs.
Hatch of Set (HOS)	The number of first quality ducklings hatched as a percentage of the number of eggs placed in the incubator.
Hatch of Transfer (HOT)	The number of first quality ducklings hatched as a percentage of the number of eggs transferred from the setter to the hatcher.
Hatch of Fertile (HOF)	The number of first quality ducklings hatched as a percentage of the number of eggs remaining after candling (excluding incubator clears).
Setting	Loading eggs into the setter.
Candling	Examination of the eggs to remove clear eggs, normally done around 10 days of age. The eggs removed are often referred to as 'Infertile', but should be remembered that these eggs may include fertile eggs in which embryo death occurred in the very early stages of incubation.
Transfer	The process of transferring eggs from the setter to the hatcher, normally done at 24 days of incubation.
Take-off	The removal of hatched ducklings from the hatcher, grading and packing them in boxes ready for dispatch.
Setter	Incubator
Growing	
Feed Conversion Ratio (FCR)	The amount of feed consumed to produce 1 kg of bodyweight.
Average Daily Gain (ADG)	The amount of weight gained per day by a duck over a given period of time.

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