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BROODING HINTS

Getting the Broiler Chick Started

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Management during the first 7 days of a broiler chick's life is critical as it has a lasting influence on health and performance for the remainder of the chick's life. The principle objective during the brooding period is to obtain the best possible early chick development and uniformity.

Excessive stress levels during the first 7 days post-hatch will increase susceptibility to disease, mortality and increase growth uniformity problems. The chick is entirely dependent on the grower to ensure the rearing environment is comfortable and secure. The objective of this article is to encourage the critical evaluation of early chick management practices in 7 key areas:

1. Water
2. Feed
3. Temperature and humidity
4. Lighting
5. Stocking density
6. Litter
7. Ventilation

Figure 1: Brooding set-up for chicks with 100% paper on the floor and supplementary feeders and drinkers to ensure the chicks have a good start.



Water

Clean, fresh and readily available water is critical for chicks and to ensure optimum performance. Inadequate water consumption during the first few days of life causes dehydration and may lead to problems, including poor uniformity of growth and increased mortality, later in the growing period.

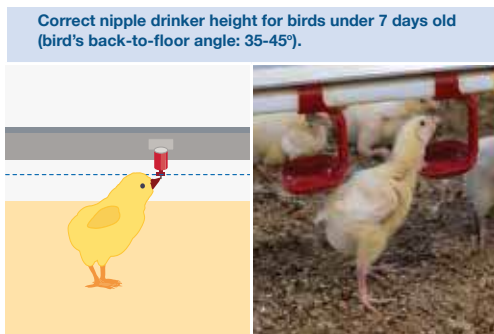
Supplemental drinkers

The use of supplemental drinkers (e.g. water fountains and mini-drinkers) is recommended during the brooding period — even when using nipple drinkers (**Figure 1**). When supplemental water fountains or mini-drinkers are used, a minimum of one 1 gallon (4 liter) drinker per 50 chicks should be supplied for the first 3 to 7 days. The duration of supplementary drinker placement will depend on chick behavior, for example supplementary drinkers may need to stay in place for longer if chicks are slow to start. Supplementary drinkers should be filled with fresh water frequently and be cleaned out regularly to prevent the build up of bacteria and debris. They need to be well spaced between feeder trays and low enough for the chicks to drink from upon their arrival (as illustrated in **Figure 1**). Drinkers should be positioned to ensure that chicks do not have to travel more than 3.3 feet (1 meter) for access to water in the first 24 hours. Unrestricted access to a supply of fresh, good quality, clean water delivered at an appropriate temperature is essential for a good chick start. Do not present chicks with cold water as it can significantly contribute to chilling, however, water temperature should not exceed 68°F (20°C).

Nipple drinkers

Nipple drinkers should be placed and maintained at chick eye level during the first 24–48 hours. Water pressure can be increased during the first one to three days to produce a ‘droplet’ of water on the nipple pin to attract the chicks. Thereafter, and normally around day three or four, the nipple drinker should be at a 45° angle, in relation to the chick’s head (**Figure 2**).

Figure 2: Height of nipple drinkers.



Bell-type drinkers

When using bell-type drinkers, the water level should be near the top of the drinker for the first 24–72 hours. Thereafter, reduce water depth level to 0.75 inches (19 mm) — roughly corresponding to a depth reaching the top of the index finger fingernail. Until 7 days of age, set the height of the lip of the drinker even with the chicks back. Afterwards, gradually raise drinkers until the bottom of the drinker is aligned with the chick’s back (**Figure 3**). Water pressure should be low and water must flow uninterrupted. Two to 3 hours after placement, check the height of the drinkers as the chicks will flatten the litter. Adjust drinker height accordingly.

Figure 3: Height of bell drinkers.



The permanent watering systems should be in position from chick placement. A gradual transfer on to these systems should start from day 1 and finish around day 21. It is recommended that water quality is routinely tested for microbial load and mineral content prior to placing chicks.

Feed

Until birds are 5 to 7 days old, Starter feed should be distributed into feed trays. Provide one feeder tray per 50 chicks. Avoid overfilling the trays as this will increase feed wastage. The Starter feed should be of a physically acceptable quality; use a course mash or preferably a sieved crumb.

The addition of paper, which can cover up to 100% (Figure 4) but not less than 25% of the litter in the brooding area, onto which feed can be directly administered, can be beneficial. The use of paper has the added advantage of preventing chicks from eating the litter material resulting in poor starts. Frequent feeding in small volumes helps stimulate the chicks.

Resting mechanical or manual feeders on top of the litter from day 1 ensuring chicks have easy access to feeders will mean that under normal conditions chicks will learn to eat from permanent feeders by the time feed trays are removed. In general this is around 5 to 7 days of age.

Figure 4: A typical brooding area for chicks with a sieved crumb and 100% paper cover on the floor.



Temperature and Humidity

The thermoregulatory system of a newly hatched chick is not fully developed until approximately 2 weeks of age. Therefore, the chick is highly dependent upon external heat sources to maintain normal body temperature.

Litter temperature

Correct litter temperature is critical for a successful start. At 1 day of age, chicks require a temperature of 86°F (32°C) at a relative humidity of 60-70% at chick level, and a litter temperature of 82-86oF (28-30°C). If chicks are standing on litter that is <82°F (<28°C) they will be chilled through their feet. Damp litter, at any temperature, will also chill chicks and should be avoided. Place thermometers at chick level throughout the house to monitor brooding temperatures.

Spot brooding

With spot brooding, houses should be preheated at least 24 hours before chick arrival. The use of brooders results in a more uniform heating of the litter and brooder guards can be effectively used to control early chick movement.

When using spot brooding, management of the temperature is critical. If brooder guards are in place and the temperature is not managed effectively chicks are at risk of becoming too warm as they are unable to move away from the heat source.

As chicks age (from day 3 onwards) the brooding circle can be gradually increased in size and eventually removed completely at around day 14. Reasonable variation in house temperature at this time allows chicks to regulate their body temperature by moving closer to or further away from the brooder.

Whole house brooding

When using hot air furnaces (space heaters) for whole house brooding, it is more difficult to warm the floor to the appropriate temperature. When using this type of heating system, houses should be preheated 48 hours prior to chick arrival in order to achieve correct litter temperature. Care is required when using surrounds to ensure their height does not restrict air flow and temperature when using whole house heating systems.

Provision of heat

Providing sufficient heat for chicks is critical. Please follow the guidelines below.

BROODING	
RECOMMENDED BROODING TEMPERATURES	
AGE (DAY)	°C
1	32°C
3	31°C
5	30°C
7	29°C
9	28°C
11	26°C
13	24°C
15	23°C

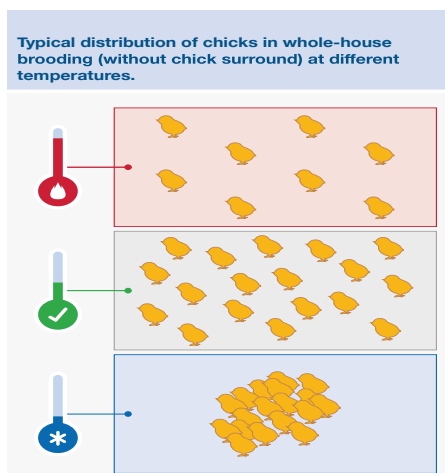
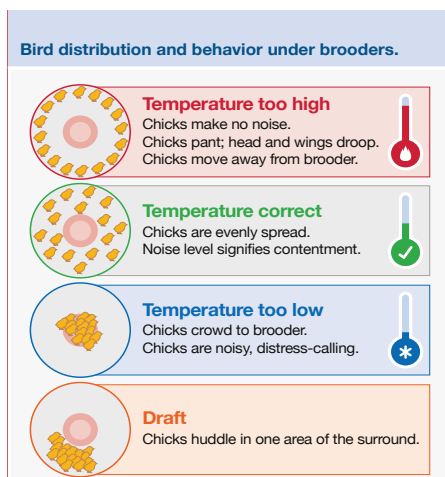
At 60 - 70% humidity
Make sure, that while keeping your birds warm, you allow clean, fresh air into chicken house.

Chick behavior

Closely monitor chick behavior during the first 24 hours after placement. After 1 to 2 hours, it will become obvious if the temperature at bird level is correct (**Figures 5 and 6**).

If behavior indicates that the temperature is incorrect then temperature settings must be checked and adjusted accordingly. Drafts must be avoided.

Figure 5: Typical behavior of birds under spot brooding.



When Chicks are warm and comfortable, they feed, drink and remain spread out in small groups. If litter is wet and cold, the chicks' feet will cool rapidly and cold-stressed chicks will huddle in large groups. They may search for warmer places and, if found, will remain there and will not venture out to look for water or feed, which may lead to starve-outs.

Lighting

It is critical to provide correct and uniform light intensity throughout the house to ensure chicks can see to feed and drink. During the first 7 days of life, provide 23 hours of light a day with a minimum house light intensity of 1 foot candle (10 lux). Within the brooding area initial light intensities of up to 10 foot candles (100 lux) can be used to promote chick activity.

From day 8 to day 21 provide between 4-6 hours of darkness to help develop the internal organs namely the heart and lungs.

From day 22 reduce the darkness period to 3 hours /day

Day 23 reduce the darkness period to 2hours/day

Day 24 to market give the bird 1 hour of darkness

Stocking Density

The following are only guide lines.

Day 1-3 40 birds per meter squared

Day 4-6 30 birds per meter squared

Day 7-9 20 birds per meter squared

Day 10-15 15 birds per meter squared

Day 21 > 10 birds per meter squared

Always brood up to 21 days in winter and if temperature permit, 15 days in summer

The above recommendations are only guide lines. These guide lines would apply during the summer month's. During the winter months you would brood up to 21 days depending on the day and night time temperatures and bird's behaviour in the chicken house. The amount of braziers would also be dependant on the size used. If you are using small braziers you would have to increase the numbers as compared to the large ones that are commonly used. Please refer to the recommended brooding temperatures. On page 4. Temperatures indicated are for a summer situation. During winter increase the daily indicated temperatures by 5.°C.

Litter Management

Before chicks arrive, cover the floor to an even depth of 2-4 inches (5-10 cm) with clean, dry litter material. Where floor feeding is practiced, use a maximum litter depth of 2 inches (5 cm). Wood shavings from dried soft woods are preferred due to their ability to absorb moisture. Correct ventilation is necessary to prevent wet litter, especially during the winter period (see following section on ventilation).

Check litter material for contamination of pesticides, molds or fungi (*Aspergillus*). Pesticides can cause liver and kidney damage and can accumulate in muscles and fat. Fungi release spores into the air causing disease, stunting and mortality when inhaled by chicks.

Ventilation

Providing good air quality for the chick is critical. Ventilation practices during the brooding period must bring in enough fresh air to provide sufficient oxygen and exhaust excess moisture and harmful gases — without chilling chicks. This practice constitutes minimum ventilation. No matter what the outside temperature,

it is essential to ventilate the house for at least some minimum amount of time when chicks are present.

Do not allow cold air from outside the house to make direct contact with chicks. The key to successful minimum ventilation is creating a partial vacuum (negative pressure) so air comes through all inlets at sufficient speed (to ensure that it is mixed with warm in house air above the birds rather than dropping directly onto and chilling them) and through all inlets at the same speed (to ensure uniform air flow). To achieve this, the house must be air tight and have air inlets evenly distributed along the entire length of the house. If managed properly, cool outside air can then enter the house at sufficient velocity and volume to mix with warm in-house air above the chicks.

Measurement of Success

A good measure of successful chick start is crop fill. The objective is to have chicks with a full crop as soon as possible after placement. The aim is to have 80% of chicks with a full crop 8 hours after delivery and more than 95% of chicks with a full crop (Figure 7) 24 hours after delivery. This ensures good early uniform body weight achievement and maintenance of uniformity.

To assess crop fill, collect small samples of 30-40 chicks at 3 or 4 different places in the house to establish whether chicks are finding food and water throughout the house.

Each chick should be handled and the crop felt gently. In chicks that have found food and water, the crop will be full, soft and rounded. If the crop is full, but the original texture of the crumb is still apparent, the bird has not yet consumed enough water.

CROP FILL

Why assess crop fill?



Figure 7: Crop fill after 24 hours. The chick on the left has a full crop while the chick on the right is empty.

the desired levels, so affecting flock uniformity and production potential.

The procedure for assessing crop fill

Crop fill should be monitored during the first 48 hours, but the first 24 hours are the most critical.

Equipment

1. A catching frame.
2. A pen or pencil.
3. Paper to record crop fill.

Procedure

An initial check 2 hours after placement will indicate if chicks have found feed and water. Subsequent checks at 8, 12, 24, and 48 hours after arrival on farm are required to assess appetite development.

- Assessment of crop fill at key times after placement is a useful means of determining appetite development and checking that all chicks have found feed and water.
- If adequate crop fill is not achieved, appetite development will be depressed, early growth rate will be compromised, and skeletal development will be below

Step 1 Using the catching frame, collect 30- 40 chicks in total; approximately 10 chicks at a time from 3 - 4 different places in the house (or surround where spot brooding is used).

Step 2 Handling each chick with care, gently feel the crop of each chick in the pen using your thumb and forefinger.

Step 3 Record the content of the crop of each chick using the following categories:

- Full, soft, and rounded – Chicks have found feed and water.
- Full but hard with original feed texture felt – Chicks have feed but little / no water.
- Crop empty – Chicks have not found feed or water.

Step 4 Calculate the percentage (%) of chicks in each category by dividing the number of chicks recorded in each category by the total number of chicks assessed and multiplying by 100.

Step 5 Compare your results with the target crop fill assessment guidelines on page 9.

Example of crop fill recording sheet.

Hours after placement	8
Category	Number of chicks in category
1. Full, soft and rounded	
2. Full but hard with original feed texture	
3. Empty	
Total Recorded	35

Example calculation:

$$\begin{aligned} \text{\% chicks in category 1 (full, soft, and rounded)} &= \frac{\text{Number of chicks in category}}{\text{Total number of chicks assessed}} \times 100 \\ &= \frac{30}{35} \times 100 \end{aligned}$$

Chicks in category 1 = 86% measured at 8 hours after placement.

Target crop fill assessment guidelines.

Time of Crop Fill Check After Placement	Target Crop Fill (% of Chicks with Full Crops)
2 Hours	75
8 Hours	>80
12 Hours	>85
24 Hours	>95
48 Hours	100

Interpreting results

Crop fill on or above target guidelines.

No action required

Crop fill 5% or more below target guidelines (e.g. 75% or lower at 8 hrs after placement).

Action required

Further investigation of brooding practices required

Areas to consider:

Environment

- Ensure that houses are pre-heated prior to chick arrival.
- Ensure chick comfort is optimum by monitoring and adjusting if needed:
 - o Air temperature at chick height
 - o Litter temperature
 - o Relative humidity
- Ensure light intensity is at the optimum level in the brooding area.
- Ensure ventilation rates are correct for young chicks.

Feed and water

- Ensure chicks have unrestricted access to feed and water.
- Ensure that at least 90% of the floor area is covered in paper with feed on.
- Replenish feed on paper in small amounts given frequently.
- Ensure supplementary (mini) drinkers are used.

Conclusions

Management during the first week of a breeder chick's life is critical if bird health and performance is to be optimized throughout its life. There are 7 critical early chick management issues to consider:

- Water
- Feed
- Environmental temperature and humidity
- Lighting
- Stocking density
- Litter
- Ventilation

All of these factors are important for early chick development and uniformity. If these management practices are achieved, early chick development, growth and uniformity will be optimized along with subsequent breeder performance.

KEY POINTS FOR BROODING

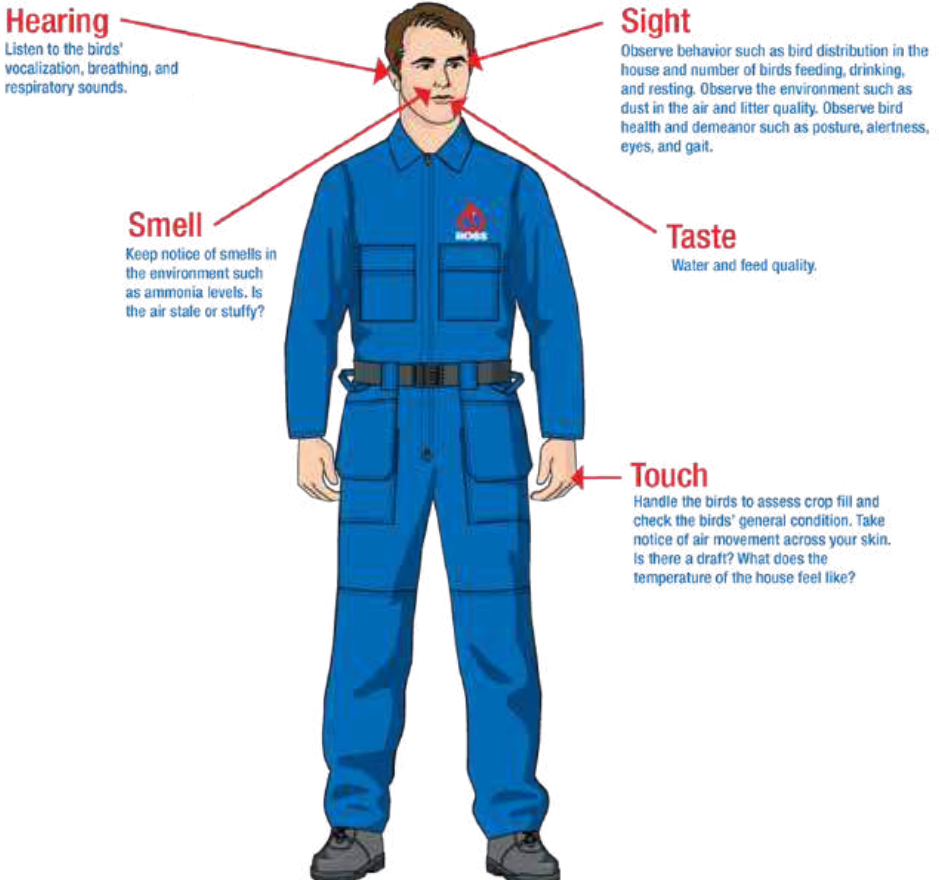
- Prepare, clean and disinfect houses and equipment well in advance of chick arrival.
- Ensure the house reaches the correct temperature and RH, with good air quality, at least 24 hours before chicks arrive.
- Ensure chicks have immediate access to fresh water and feed.
- Use chick behavior as an indicator of satisfactory brooding temperature.

- Replenish feed frequently during the brooding period.
- Monitor crop fill to ensure chicks are feeding and drinking, especially during the first 24 hours.
- Check and adjust feeders and drinkers daily.
- Check the chicks at regular intervals throughout the day.

BASIC COSTING	
BIRDS PURCHASED	
FOOD: STARTER	
GROWER	
FINISHER	
D.O.C	
LITTER	
CHARCOAL	
ELECTRICITY	
VACCINE	
MEDICATION	
CHEMICALS	
CLEANING	
WATER	
SECURITY	
CATCHING	
LABOUR	
POULTRYMEN	
MANAGEMENT	
RENT	
CAPITAL REPAYMENT	
INCOME:	
LIVE SALES	
DRESSED	
MORTALITY	
MANURE	
PROFIT/LOSS	

Stockmanship

Stockmanship is the knowledgeable and skillful handling of livestock in a safe, efficient, effective, and low-stress manner. In broiler production, stockmanship is key for broiler welfare, performance, and profitability. The result of the positive human interaction with the broiler and its environment (stock sense) breeds good stockmanship. Every stockman has to be in tune with and aware of the birds in the flock and their environment by closely monitoring the bird's behavioral characteristics and the conditions within the poultry house. This monitoring is commonly referred to as 'stock sense' and is a continuous process that uses all the stockman's senses. The figure below illustrates the use of all senses to monitor a flock.



Heat Stress Management in Broilers

High ambient temperatures can be devastating to commercial broilers; coupled with high humidity it can have an even more harmful effect. Heat stress interferes with the broilers comfort and suppresses productive efficiency. During periods of heat stress the broiler has to make major thermo-regulatory adaptations in order to prevent death from heat exhaustion. The result is that the full genetic potential of the broiler is often not achieved.

What is the broilers natural physiological response to heat stress?

Broilers subject to high environmental temperatures exhibit many behavioral changes which allow them to re-establish heat balance with their surroundings. Broilers rest more during periods of heat stress. Some birds will stand quietly while others simply crouch near walls or waters. Usually, their wings are spread away from the body to promote cooling by reducing body insulation. Within the bird, blood flow is diverted from certain internal body organs such as the liver, kidneys and intestines to dilated blood vessels of the peripheral tissue (skin) in order to help heat loss.

Hyperventilation or “panting” increases during periods of high environmental temperature. Heat loss through evaporative cooling allows the broiler to dissipate the heat it is generating. However, panting requires increased muscle activity and this results in an increased energy requirement which is associated with heat stress. Therefore, decreased energy efficiency also

accompanies hot weather. Panting would normally be expected to occur when the ambient temperature is near or above 30°C. Relative humidity influences evaporative heat loss through panting. Broilers, as well as other domestic poultry, cannot tolerate high temperature coupled with high relative humidity. Death due to heat exhaustion will occur very quickly, especially in heavier birds, if both temperature and humidity are high. In normal birds, panting will remove approximately 540 calories per gram of water lost by the lungs.

How will panting influence pH or acid-base balance in the broiler?

Normally, blood pH is controlled by the lungs and kidneys along with the various buffer systems which prevent rapid changes in the pH. However, as the respiratory rate increases in heat stressed broilers, there is a corresponding decrease in the levels of blood carbon dioxide. Respiratory alkalosis (elevated blood pH) results. Heat stress also depletes potassium and other minerals in the body, altering the delicate electrolyte balance in the body.

Should a decrease in feed intake be expected during heat stress?

Yes. Broilers maintained in hot environments reduce their feed consumption. This is a part of their physiological adaptation to heat stress. The reduction in feed intake results in a decrease in the daily intake of nutrients responsible for growth. However, fewer

nutrients to metabolize means less heat produced by the body. Thus, even though growth is slowed, the broiler can now more easily cope with the heat because of the lessened need for heat dissipation. Research data clearly shows that the survival rate of broilers decreases as feed intake increases during heat stress, especially during the hottest part of the day.

Why is fasting beneficial during heat stress?

Feeders should be raised during the hottest part of the day which is between 11:30 - 3pm. This fasting reduces the heat production from digestion, absorption and metabolism of nutrients. Fasting also has a calming effect. Movement in animals occurs through muscle contraction which generates heat. In hot environments this heat production only adds to the heat load. Therefore, to lessen the heat load, broilers should be kept as calm as possible. This is especially important during the hottest parts of the day. Once the hottest periods are over and ambient temperature starts to fall, the broilers will usually begin consuming feed again.

What alleviates heat stress in broilers?

In hot/humid environments with open-style houses adequate air movement and water consumption are essential.

Ventilation should be maximized. Air movement facilitates removal of build-up ammonia, carbon dioxide and moisture. Panting is accompanied by an increase in water loss by the lungs. Therefore, more water has to be consumed by broilers during hot weather in order to prevent dehydration. Cool drinking water stimulates both feed and water intake. Reducing the body temperature of heat stressed broilers is beneficial. When the temperature of drinking water is lower than body temperature it will absorb body heat. Therefore, providing adequate and cool drinking water is extremely important to heat stressed broilers. Usually, anything that results in increased water consumption during heat stress will benefit the survival rate.

Summary

Broilers under heat stress have to make critical life sustaining physiological adjustments. Feed intake is depressed and water intake is increased. Dietary adjustments can help reduce metabolic heat production and maintain nutrient intake. Energy intake and amino acid balance is of extreme importance in heat stress. Providing adequate ventilation and stimulating water consumption is essential. Minimizing bird activity during the hottest parts of the day lessens the heat burden. Controlled fasting is beneficial and usually increases survival rate of broilers during heat stress.

Effective Management Practices to Reduce the Incidence of Ascites in Broilers

Introduction

Ascites is a multi-factorial syndrome caused by interactions between physiological, environmental and management factors. Its presence in a broiler flock will have a significant effect on the biological and economical performance of the flock. The key to preventing Ascites is ensuring that good basic management is adhered to, particularly with regards to ventilation.

What is Ascites?

Factors that increase the workload of the heart by increasing the demand for oxygen (such as fast growth rate, cold stress, low partial pressure of oxygen or respiratory diseases) can lead to Ascites.

Leakage of fluid from the liver into the abdominal cavity eventually restricts breathing and ultimately can lead to death. Reducing the Incidence of Ascites in Broiler Flocks

1. Ensure adequate ventilation from placement to depletion. Ventilation rates should be linked to house biomass, supplying enough air to replenish the oxygen consumed and ensure the adequate removal of waste gases. Providing sufficient oxygen is vital at high altitudes. Oxygen is a constant percentage of air, but at low atmospheric pressures associated with altitude, the absolute levels of oxygen may predispose birds to Ascites, particularly when other factors increase metabolic rate.
2. Maintain air quality. This is directly associated with good ventilation and appropriate litter management.

High levels of air contaminants (e.g. carbon monoxide, carbon dioxide and dust) cause respiratory damage. This reduces respiratory efficiency and blood oxygen levels increasing the risk of Ascites.

3. Avoid periods of cold stress particularly during the brooding period. Exposure to cold periods increases the metabolic rate (oxygen demand) and can lead to Ascites later in the production period. At placement, floor temperatures should be 28-30°C (82-86°F), air temperature should be 30°C (86°F) and relative humidity between 60-70%.
4. Lighting programs. An additional 1-2 hours of dark added to the recommended 4. hours for broilers <2.5kg/5.5lbs (from 8 days of age to slaughter) or 6 hours for broilers >2.5kg/5.5lbs (from 8 days of age to slaughter) may help reduce Ascites. Do not implement light programs before 7 days of age.

KEY POINTS

- Achieving appropriate ventilation (based on house biomass) from placement through to depletion is essential, particularly at high altitudes.
- Prevent unnecessary increases in metabolic rate due to periods of cold stress, particularly during the brooding period.

Causes of Ascities

Introduction

Ascites, water belly or pulmonary hypertension syndrome is a disease of broiler chickens that can occur worldwide. Its presence in a broiler flock will have a significant effect on the performance of the flock both biologically and economically.

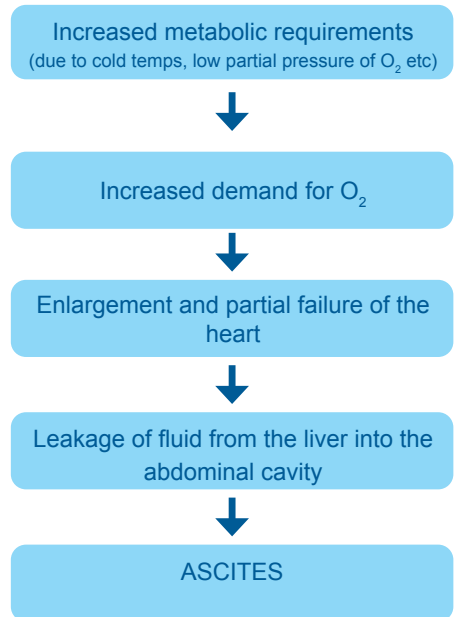
Ascites is a multi-faceted syndrome caused by interactions between physiological (e.g. O₂ demand), environmental (e.g. altitude) and management (e.g. ventilation, disease status) factors. Although Ascites may be most common (with substandard environmental conditions and poor brooding temperatures can also have higher mortality and processing downgrades as a result of increased Ascites incidence.)

What is Ascites?

Understanding Ascites is the first step to reducing or stopping its incidence in broiler flocks.

Any factors that increase the workload of the heart by increasing the demand for oxygen (e.g. fast growth, reduced environmental temperatures, low partial pressure of oxygen or respiratory diseases) can lead to Ascites. When the workload on the heart and lungs is increased, a chain of events is triggered (Figure 1) that leads to reduced levels of oxygen in the blood. In the initial stages this can be detected by a slight darkening of the comb and wattles. As the disease progresses, fluid (leaked from the liver) accumulates in the abdominal cavity. Eventually this restricts breathing (it is at this stage that the comb and wattles exhibit a dark blue) and ultimately, it is this restriction that leads to death.

Figure 1: Chain of events leading to Ascites



Accumulation of fluid in the abdominal cavity.

Ventilation and Ascites

The most influential environmental factor affecting Ascites in broilers is the oxygen content of air brought into the poultry house.

Suboptimal ventilation in broiler houses leads to low environmental oxygen and higher toxic gases such as carbon monoxide, carbon dioxide and ammonia. This will put extra pressure on the cardiovascular system thus reducing its capacity to carry oxygen and increasing Ascites.

Ventilation rates must supply enough air to replenish the oxygen consumed and ensure the adequate removal of waste gases.

Air Quality and Ascites

Correct litter management in conjunction with appropriate ventilation helps to maintain air quality. Suboptimal ventilation and inadequate litter management leads to problems of wet litter and increased ammonia levels. Dust within the environment will be inhaled by the birds thus leading to irritation and reduced efficiency of the airways. Poor air quality, dust and respiratory diseases all predispose birds to Ascites by causing respiratory damage thereby reducing the efficiency of respiration and blood oxygen levels. For the same reasons it is important that the litter material is clean and free from mold or contamination at the time of placement.

Temperature and Ascites

Maintaining adequate brooding temperatures are critical to the prevention of Ascites. Exposure to cold periods that place birds outside their thermo-neutral zones will increase the demand for oxygen as birds are forced to use energy to keep warm. This increase in metabolic rate can lead to Ascites later in the production period. Correct and monitored

temperature during brooding, along with a good minimum ventilation program from placement, will help reduce and in some cases eliminate any Ascites problems seen later in the grow-out period.

At placement, floor temperatures should be 28-30°C (82-86°F) and air temperature (measured at bird level) should be 30°C (86°F) with relative humidity between 60 and 70%. Table 3 shows a good brooding temperature profile for the broiler house. The temperatures recommended in Table 3 assume an ideal relative humidity (RH) of 60-70%. If RH is outside this ideal range, the temperature of the house at bird level should be adjusted accordingly. For example, if RH is below 60% or above 70%, the dry bulb temperature may need to be increased or decreased respectively.

Table 3: Correct brooding temperature profiles assuming an ideal RH of 60-70%

Age (days)	Whole-house Brooding	Spot Brooding	
	Temp	Temp	
		Brooder Edge (A*)	2 m (6.6 ft) from Brooder Edge (B*)
Day-old	30°C (86°F)	32°C (90°F)	29°C (84°F)
3	28°C (82°F)	30°C (86°F)	27°C (81°F)
6	27°C (81°F)	28°C (82°F)	25°C (77°F)
9	26°C (79°F)	27°C (81°F)	25°C (77°F)
12	25°C (77°F)	26°C (79°F)	25°C (77°F)
15	24°C (75°F)	25°C (77°F)	24°C (75°F)
18	23°C (73°F)	24°C (75°F)	24°C (75°F)
21	22°C (72°F)	23°C (73°F)	23°C (73°F)
24	21°C (70°F)	22°C (72°F)	22°C (72°F)
27	20°C (68°F)	20°C (68°F)	20°C (68°F)

*These brooding temperatures are a recommendation. Actual brooding temperatures will depend on environmental and management conditions in the

house. For more information on brooding temperatures, consult your local Ross technical representative.

Duration of cold stress is much more critical than temperature itself. Metabolic stress and risk of Ascites will be increased with duration of cold stress. It is therefore vital that if periods of cold stress do occur, they are rectified as quickly as possible.

Influence of Growth Rate on Ascites

There is a direct correlation between metabolic rate and Ascites levels. A fast growth rate increases the demand for oxygen and hence the workload of the heart. Therefore adapting good management practices is vital for fast growing broilers.

Lighting and Ascites

To help ensure proper heart and lung development in growing birds it is essential that 7-day body-weight targets are achieved and that lighting programs are not implemented until after 7 days of age.

Table 4: Basic light intensity and photoperiod recommendations to optimize live performance

Live Weight at Slaughter	Age (days)	Intensity	Day Length (hours)
<2.5 kg	0-7	30-40 lux	23 light 1 dark
	8-slaughter	5-10 lux	20 light 4 dark
<2.5 kg	0-7	30-40 lux	23 light 1 dark
	8-slaughter	5-10 lux	18 light 6 dark*

Conclusions

Ascites is a multi-factorial syndrome caused by interactions between physiological, environmental and management factors. The incidence of Ascites can be reduced by ensuring that good basic management practices are adhered to.

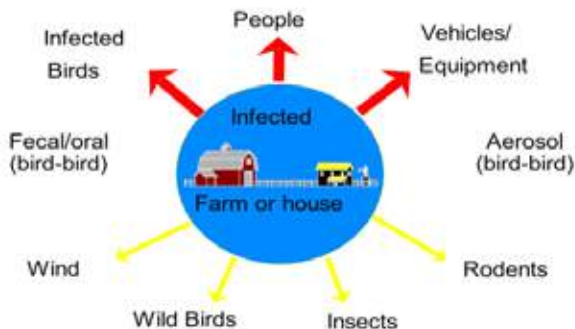
- Achieve appropriate ventilation in the poultryhouse from placement through to depletion is essential, particularly at high altitudes. Ventilation rates must supply enough air to replenish the oxygen consumed and ensure the adequate removal of waste gases.
- Prevent unnecessary increases in the birds' metabolic rate due to periods of cold stress, particularly during the brooding period. This will help reduce or even eliminate the occurrence of Ascites later in the growing period.
- Well managed growth control programs implemented after 7 days of age may also help where the incidence of Ascites is high.

A better understanding of what Ascites is and how it is caused, and the implementation of management factors that reduce the predisposing factors to Ascites, will ultimately help to control the occurrence of Ascites in broiler flocks.

POULTRY BIOSECURITY

Biosecurity can be defined as a series of management practices designed to prevent the **introduction** of pathogenic agents such as Viruses, bacteria, protozoa, fungi and parasites onto a farm as well as the prevention of **further spread** from infected to non-infected flocks within a farm. Biosecurity helps create hygienic conditions within the poultry houses which in turn helps minimise the adverse effects of disease, optimizes bird performance and welfare as well as provides assurance on food safety issues. It is not true that biosecurity is only to be practiced by Commercial farmers. Disease outbreaks will occur anywhere where there is a breach of biosecurity protocols. For this reason, all poultry farmers, be it small scale, backyard or commercial need to observe biosecurity. The figure below represents the common ways through which poultry diseases are transmitted.

How are poultry diseases Commonly transmitted?



What key Biosecurity Steps can one take to reduce risk of disease transmission onto their farm?

1. **Prevent unauthorized entry of people into your farm or poultry house:** Visitors especially if coming from another poultry site are likely to carry disease agents onto your farm or poultry house and therefore should not be allowed near poultry site. This includes customers who would like to buy chickens when they are ready for market as they usually move from one poultry farm to the other in search of quality chickens.



2. **Restrict movement of vehicles onto your farm:** vehicles, just like people can carry diseases from one farm to the other. All essential vehicles coming to the farm must be thoroughly disinfected.
3. **Bird proof Poultry houses:** Wild birds act as carriers for many poultry diseases. They should therefore be prevented from accessing poultry houses as they bring diseases. Poultry houses should have a chicken wire mesh covering the open sides of an open sided poultry house. Feed spillages outside the poultry house must be cleaned to avoid attracting wild birds to your poultry sites.
4. **Implement an effective rodent, insect and vermin control.** Apart from transmitting diseases, rats consume a lot of feed which tend to increase your feed costs.



5. Use wash-bays, foot baths, hand-wash as well as dedicated footwear and clothing as you enter the poultry site.



6. Avoid re-introducing birds in the poultry house after being at the market, clean and disinfect all equipment such as crates after use and wash hands after handling eggs or manure.
7. Correctly dispose off manure to avoid microbiological load build up at your site.

Cleaning and Disinfection, a critical aspect of biosecurity!

Site cleaning minimizes the risk of disease from all the routes through which diseases are transmitted and also reduces the number of residual bacteria, viruses, parasites, and insects between flocks. Providing an adequate period of downtime of about 14 days between flocks is key.

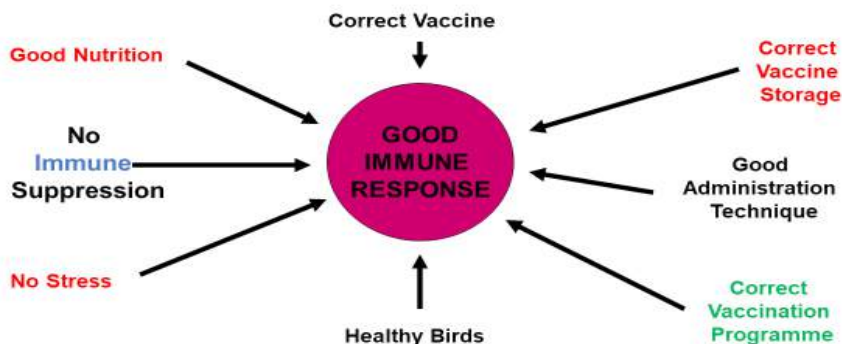
5 Steps to successful Cleaning and disinfection

1. **Dry Clean:** remove all organic matter and dispose-off the manure away from the site as well as dusting and removing all cobwebs.
2. **Soap:** Wash and scrub all surfaces starting with the roof, walls floors with a soapy agent or detergent
3. **Rinse:** Using clean water, rinse the whole poultry house thoroughly
4. **Dry:** Allow the poultry house to completely dry in readiness for disinfection
5. **Disinfect:** Use an approved disinfectant, effective against specific poultry bacteria and viruses. Ensure to follow manufacturer's instructions.

Key Vaccination Principles

Vaccination is the introduction of an agent that resembles a disease-causing organism in order to improve immunity to a particular disease. Immunity is protection against an infectious disease.

Requirements for Good Immune Response



Steps in successful drinking water vaccination

- ☐ Plan your vaccination for cool hours of the day
- ☐ Provide enough drinkers
- ☐ Discontinue any in-water treatment or water disinfection 24hrs prior to vaccination
- ☐ Withdraw water 1 to 2hours depending on season, with shorter period when its hot season
- ☐ Use a water stabilizer or skimmed milk to dechlorinate the water
- ☐ Get your vaccine vial, remove the plastic lid, then the metallic cap and finally remove the rubber while holding the vial under the water.
- ☐ Stir well and fill the reconstituted vaccine into sufficient drinkers
- ☐ Allow the birds to drink within 1 to 2hrs and carry out a tongue score to measure the success of your vaccination.

RISKS & RECOMMENDATIONS FOR MULTI-AGE BROILER FARMS

Dr Frank Travers - Veterinary Specialist: Poultry Health

Definition of multi-age broiler farm:

Different ages broilers placed together in houses or sites, where there is no period of rest of the farm. At no stage is the farm free of broilers and organic material. (Compared to an all-in, all-out single age farm with a rest period with no broilers and organic material on the farm).

Risks with multi-age broilers farms:

1. High and continuous load of infectious organisms at all times. This leads to the risk of broilers becoming sick and dying. There are many diseases that can be involved:
Gumboro, Newcastle & Colisepticaemia for example.
2. Reduced growth and feed conversion, and increased mortality.
3. Increased cost because of the need to use more vaccines and medication.
4. Variable growth, increased culls and poorer weights.

5. Difficult to remove old litter without the risk of spreading disease.
6. Higher risk of litter beetle, which may transmit / carry diseases.
7. Higher risk of rodents – carry disease and Salmonella.

It is recommended that a multiage farm be cleaned of all litter and organic material, washed & disinfected with approved products and rested after disinfection for a minimum of 2-3 weeks on an annual basis (that is – no broilers on the farm).

If dirt floors are used, the rest process may be adapted by removing a layer of dirt from the houses and using a lime / salt mixture to seal the floors and areas around the houses.



Influence of Housing on Profitability

Modern fast-growing broilers are more dependent on suitable environmental conditions than any other poultry birds. It is for this reason that suitable broiler poultry housing is very important for profitable production. Key features for an open sided poultry house to consider are as indicated on the recommended house below.

East west orientation

Cross air Ventilation

Width: Not more than 10M



Suitable Open Sided House



Bad House: Limited Ventilation, Too short.

Possible problems in such a house include:

- Poor growth rate
- Poor Feed Conversion ratio (Use more feed than you should to make your birds reach target weights)
- Accumulation of air contaminants such as ammonia gas, carbon monoxide (when using charcoal), dust and carbon dioxide
- High incidence of respiratory problems and ascites (water belly)
- Results in bad bedding thereby increasing the cost of bedding materials.

NB: Weigh your birds weekly to effectively monitor their performance.



NUTRI
FEEDS

ROSS BROILER PERFORMANCE - BREED STANDARD

The average weight data was extracted from the Ross Broiler Performance Objectives 2022.

WEEK	WEEKLY MORTALITY	CUMMULATIVE MORTALITY	AVERAGE WEIGHT GAIN
1	1	1%	213g
2	0.5	1.5%	533g
3	0.5	2%	1012g
4	0.5	2.5%	1616g
5	0.5	3%	2296g
6	0.5	3.5%	2998g

**DID YOU KNOW THAT THESE RESULTS CAN BE ACHIEVED UNDER GOOD
MANAGEMENT PRACTICES IN OPEN-SIDED POULTRY HOUSES?**

Your results begin with quality nutrition - choose

NUTRI
FEEDS

OMNIA OUTLETS		
FEED AND CHICKS		
Omnia 10 Miles	10 miles	260767043884
Omnia Chongwe	Chongwe	260767043886
Omnia Chisamba	Chisamba	260767043900
Omnia Chibombo	Chibombo	260767043844
Omnia Makeni	Makeni	260767043830
Omnia Mumbwa	Mumbwa Town	260767043877
Omnia Soveto	Soveto Mumbwa RD	260767043899
Omnia Kabwe	Kabwe	260767043843
Omnia Kapiri	Kapiri	260972762019
Omnia Serenje	Serenje	260767043826
Omnia Mkushi	Mkushi	260767043889
Omnia Mpika	Mpika	260767043897
Omnia Ndola	Ndola	260767043911
Omnia Solwezi	Solwezi	260767043838
Omnia Mazabuka	Mazabuka	260767043971
Omnia Monze	Monze	260767043963
Omnia Choma	Choma	260767043907
Omnia Kalomo	Kalomo	260767043823
Omnia Livingstone	Livingstone	260767043873
Omnia Katete	Katete	260767043872
Omnia Lundazi	Lundazi	260767043864

LUSAKA RESELLERS		
FEED AND CHICKS		
Livestock Services	Along Pamodzi Drive Showgrounds	260977753948
Brooklyn Agro	Shimabala	260977595741
Chick Plus Makeni	Stand#47/3/396A Along Makeni Road	260979350000
Tiki Agro	Bauleni Lusaka	260965827723
E-Msika Services	Off Chilumbulu Road Libala	260976626406
Forever Advancing Agro	Chilenje Market	260977881967
Cedar Agro	Kamanquu Shops #2 Along Mumbwa Road	260977227466
Chickmar Enterprise	Value Village Complex Shop #10 Along Great East Road	260966728807
Grandeur Enterprise	Chaisa Along Great North Road	260974751422
M Stanley Innovation	Ngwerere	260977884228
Latafa Agro Chalala	Chalala	260972035037
Latafa Agro Shantumbu	Shantumbu	260972035037

CHICKS ONLY		
Pyramid Vet Stalilo	Stalilo Shopping Complex Stand#2 Along Great East Road	260977275332
Pyramid Vet Kalingalinga	Kalingalinga Mall Along Alick Nkata Road	260977725332
	Rashid Shopping Complex stand #29389 shop #6	
Pyramid Vet Makeni	Makeni Rd	260977275332
Agriwet Africa	Off Kafue Road	260962202849
FA Chicks Chilanga	Chilanga	260966739644
ATS Retail Makeni	Stand# Off Kafue Road Opp Lamise Investments	260975745970
Farmers Animal Feed	Chazangwa	260955888824
Utendi Enterprises	Zingalume	260972153941
YZ General Dealers	Matero	260963796066
Hami General Dealers	Kafue Opp Chokoswe Primary	260973101876
Hami General Dealers	Chirundu Along Chiyawa Road Opposite Taxi Rank	260971168866
African Agrovet	Off Lumumba Road	260763301431

RESELLERS IN EASTERN PROVINCE		
FEED AND CHICKS		
Zaulimi Agric Chipata	Kamina Streets Down Shops Stand #51S	260977745420
Rochis Ent	Petauke	260979301807
CHICKS ONLY		
Cornaco Chipata	Chipata	260979646477
ATS Retail Nyimba	Nyimba Trade Center Along Great East Road	260961198512
Namu Solutions	Petauke	260977988447
MC Sangwani Katete	Katete	260966996195
MC Sangwani Petauke	Petauke	260966996195
MC Sangwani Sinda	Sinda	260966996195
MC Sangwani Nyimba	Nyimba	260966996195
Tims Safari	Feira Luangwa	260979603860

RESELLERS IN SOUTHERN PROVINCE		
FEED AND CHICKS		
	Mazabuka Fashions Stand 70 Shop 4 next to Local Bus	
Maz Agrovet (HW Enterprise)	Stop Main Street	260977864174
	Remote Access	260955881383
	Maamba	
CHICKS ONLY		
Acrolivestock (Acropolis Monze)	Monze Town Along Lstone Road	260967490038
Farmarama Choma	Stand# 346 Along L/Stone Road Next to Mutupa Milling	260962220600
Cassia Agro	Monze	260977563047
Griffins Services	Chikankata	260964587158
Griffins Services	Mazabuka	260964587158
Griffins Services	Namwala	260960283616
Future Fresh	Siavonga	260979660502

RESELLERS IN CENTRAL PROVINCE		
CHICKS ONLY		
Mukango Agro Kapiri	Stand #497 Along Great North Road	260971717330
Farmarama Kapiri	Stand# 1 Along Great North Road Opp Main Bus Station	260962220651
Mumbwa Agro	Cashman Complex After Pep	260969871719
Farmarama Mumbwa	Farmarama Ltd Stand# 251 Old Kabwe Road	260978604340

FEED AND CHICKS		
Latafa Agro Kabwe	Kabwe	260972035037
AVIAN VENTURES OUTLETS		
FEED AND CHICKS		

Mufilira	Crn of Buteko & Chachacha	260962074759
Chingola	Chingola	260967648673
Chillilabobwe	2nd Class Bus Stop	260962020132
Solwezi	Main Rd Next to CAT Offices	260969788115
Kalulushi	Kabwe St Near Main Bus Stop	260969529301
Av Mansa Shop	Plot #1 President Ave	260962210321
Kitwe Wusakile	Kitwe Wusakile	260962391113
Kitwe Chimwemwe	Kitwe Chimwemwe	260962725640
Lumwana	Lumwana	260962904852
Ndola Town Centre	Ndola Town Centre	260962887488
Ndola Masala	Ndola Masala	260962904150
Luanshya	Luanshya	260962904881
Chambeshi	Chambeshi	260960775208
Lumwana Kalumbila	Kalumbila	260769921160
Luangwa	Kitwe	260966451245
Kasempa	Kasempa	260966451245
Samfya	Samfya	260966451245
Kawama	Kitwe	260966451245
Chamboli	Chamboli	260966451245
Kitwe Zamtan	Kitwe	260966451245
Kitwe Main Depot	Kitwe	260966451245

RESELLERS IN COPPERBELT PROVINCE		
FEED AND CHICKS		
Above Only	Ndola	260965435520
Lungama Chamboli	Chamboli	260977218576
Lungama Mokambo	Chambeshi	260977218576
Lunguma Mpatamatu	Lunguma Mpatamatu	260977218576
Lunguma Mufulira	Mufulira	260977218576
Lunguma Kamfinsa	Kamfinsa	260961713840
Late Harvest	Ndola	260966906211
Sherbourne Agro	Kitwe	260973137226
Maspat Agro	Kitwe	260962828862
Jonicoel Ent	Mwansabombwe	260969648424
Swinney Ent	Kitwe	260977820220
Wonderfields	Riverside Kitwe	260966926970
Tarmrotts Suppliers	Roan	260767793862
Tarmrotts Suppliers	Minkonfwa	260762732427
Tarmrotts Suppliers	Twapia	
Tarmrotts Suppliers	Kabundi	
Tarmrotts Suppliers	Buyantanshi	
Tarmrotts Suppliers	Chibuluma	
Tarmrotts Suppliers	North Kalengwa	
Ts Agro	Luanshya Town	260965176150
J-lzlor	Kitwe Chimwemwe	260966308168
J-lzlor	Buchi	260962422207
J-lzlor	Changanamai	260761915056
J-lzlor	Mindolo	260762592850
J-lzlor	Kawama	260964543421
J-lzlor	Garneton	260766274093
Jas - KB Trading	Mwansabombwe	260976987300
Lenhart	Kitwe	260961106999
Kasumbalesa Commodities	Kasumbales Market	260977755110

RESELLERS IN WESTERN PROVINCE		
CHICKS ONLY		
Patmans Business Solution	Senanga New Market Next Legetta Bakery	260963884261
Vines Agro Shop	Sesheke	260977523341

RESELLERS IN MUCHINGA PROVINCE		
CHICKS ONLY		
	Along Great North Road Near Atlasmara Bank Nampluma	
Three Brothers Investment	Chinsali	260979566304
MB Agro	Chinsali	260979484201
Swift Onet	Nakonde	260975239525
FEED AND CHICKS		
Zhanji Agro	Mbala	260963445242

ROSS DEPOT LOCATIONS

Kalingalinga ABT	Plot B7/B8/17 Off Kamloops Rd, Kalingalinga Compound	0961836122
Mutendere ABT	Shop 1, Plot 34/CH80, Kazimai Market, Mutendere	0764863593
Soweto ABT	Shop 2100, New Soweto Market, Lusaka	0965254274
Foxdale ABT	Along Zambezi Road Opposite MTN Headquarters	0764319552
Matero ABT	Shop No 7 Petrosa Lilanda Filling Station Along Common Wealth Road Lsk	0767898921

COPPERBELT SUPREME DEPOTS

Solwezi ABT	Along Kansanshi Road Mushitala Opposite Soltech	07643221616
Kasumbalesa ABT	Shop 9, Plot P2/H2/N2/J2, Chililabombwe, Kasumbalesa	0960186324
Chifubu Depot	Plot 656 Muleya Street Chifubu Township Ndola Opposite Council Library	0967051542

COPPERBELT SUPREME, NUTRI FEED & CHICK DEPOTS

Chililabombwe Depot	55A North Way, Town Centre, Chililabombwe	0768622745
Chingola Town Depot	Plot No 1228 Shop No 07 Mkushi Road Town Centre Chingola	0967392231
Jacaranda Depot	Jacaranda Point Mall Along Komando Road Ndola	0767898245
Kalulushi Rd Depot	Nutri Kitwe Mill, Off Kalulushi Rd, Kitwe	0768821439
Kalulushi Town Depot	Kalulushi Mine Area Chibuluma Round About	0968760573
Luanshya Depot	109 Paikani St, 2nd Class, Luanshya	0768622744
Kitwe ABT	Shop 7474, Kabelanga Ave, Town Centre, Kitwe	0960446919
Kwacha Depot	Plot 527, Mporokoso Road, Kitwe	0975994993
Masala Ndola Depot	Plot Number 2565/5 Kawambwa road	0768623013
Mwaiseni Depot	Shop 1, Plot 8A, Zambezi Rd, Mwaiseni Commercial, Chingola	0762434098
Ndeke Depot	Plot 30, Sokono Avenue, Ndeke, Kitwe	0960186919
Ndola Depot	Kabelanga Avenue, Ndola	0764863598
Nkana East Depot	Shop 9, Chisuwasa Emporium, Central St, Nkana East, Kitwe	0960186771
Pamodzi Depot	Shop 80B Mwanawasa Road Ndola Pamodzi	0968760573
Riverside Depot	Off Almalik Road Next to G&G Bakery Riverside Kitwe	0965363514

LUSAKA SUPREME, NUTRI FEED & CHICK DEPOTS

Barlstone Depot	Shop 3, Exodus Building Plot, 1938/SU1/3, Mungwi Rd	0961836425
Chongwe ABT	Stand No. 1920421, Great East Road, Chongwe	0960186424
Chawama Depot	Shop 9, Plot BP65/Block 269, Off Chifundo Rd, Chawama	0961102360

Checkpoint Depot	Shop 4, Plot 30511/M, Great North Rd, Kabangwe	0965254133
Chilanga Depot	Shop 2, Plot 1361, Kafue Rd, Chilanga	0961102361
Garden Depot	Along Katima Mulilo Road Plot No 11/Block 101 Garden Lusaka	0762633453
Kafue Depot	Shop 2, Plot 0255, Ulendo street, Kafue	0961102413
Kafue Estate Depot	Adjacent to Kafue Estate Zesco Offices	0967659417
Kamanga Depot	Mpezeni Centre, Ngwerere Rd, Chelstone	0762434099

Kamwala South Depot	Shop 3, Fortune Business Centre, Plot 916/1 Sub A & B, Kamwala South	0961102409
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Lusaka West Depot	Nosh Complex stand # BP 26/24 Along Mumbwa Road	0961102519
Makeni Villa Depot	Shop 1, Plot 687, Los Angeles Rd, Makeni Villa, Lusaka	0960186634
Mimosa Depot	Mimosa Farms, Plot 3A of 49A, off Kafue Road, Chilanga	0765622282
Showgrounds Depot	Lusaka Showgrounds, Cattle Section, next to Vetlab	0762434084
Waterfalls Depot	Nutri feeds Stand # 789936 Off Great East Road	0961102412

Woodlands Depot	Plot 7417 of 1993, Muramba Rd, Chilenje South, Lusaka (Chris Corner)	0961102408
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LUSAKA NUTRI FEED AND CHICK DEPOTS

Ibex Hill Depot	Shop 1, Plot 1728/1, Ibex Rd, Lusaka	0965254267
Libala South Depot	Shop 4, Plot 26565, Kasama Rd, Libala South, Lusaka	0963916953
Lilayi Depot	Plot 405A/6, Lilayi Mall, Lilayi Road	0968210105
Meanwood Depot	Plot 11883, Corner Palm Drive and Airport Rd, Airport Roundabout	0965254415

SOUTHERN NUTRI FEED AND CHICK DEPOTS

Livingstone Depot	Plot 4547, Mwela Road, Livingstone	0961102517
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NORTHERN NUTRI FEED AND CHICK DEPOTS

Kasama Depot	Shop 2/3, Plot 3304, Mbala Rd, Kasama	0963834987
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LIAPULA NUTRI FEED AND CHICK DEPOTS

Mansa Depot	Along Chembe Road Near Mansa General Hospital	0769663358
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NORTH WESTERN NUTRI FEEDS AND CHICKS

Solwezi Depot	Plot 8408 Town Centre Solwezi	0964302780
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WESTERN NUTRI FEED AND CHICK DEPOTS

Kaoma Depot	Plot 553 Along Freedom way Kaoma Western Province	0969445924
Mongu Depot	Plot 157, Independence Avenue, Mongu	0965254153

Ross Breeders Zambia Day Old Chicks

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