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BROODING HINTS

Getting the Broiler Chick Started

Dave Watts, Regional Technical Manager, Western Europe

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.

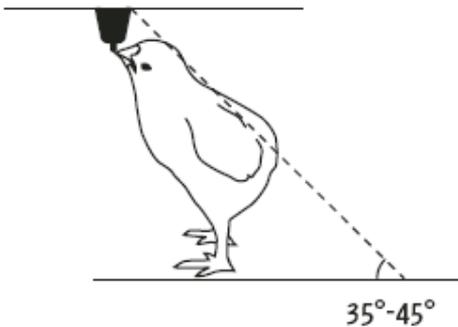
Supplemental drinkers

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 60 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 60 chicks. Avoid overfilling the trays as this will increase feed wastage. The Starter feed should be of a physically acceptable quality; use a coarse 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 82-86°F (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.

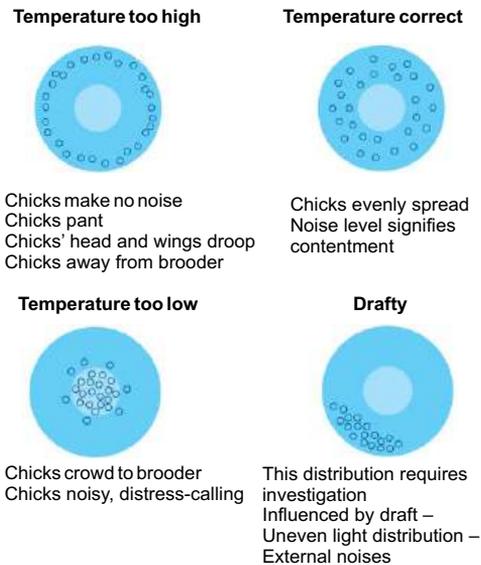
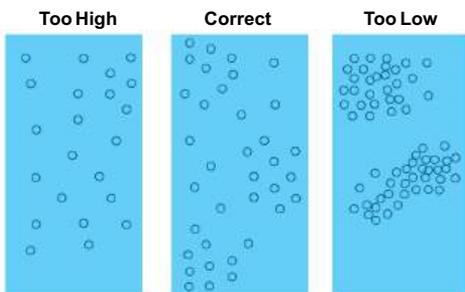


Figure 6: Typical behavior of birds under whole house brooding.



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:

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

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

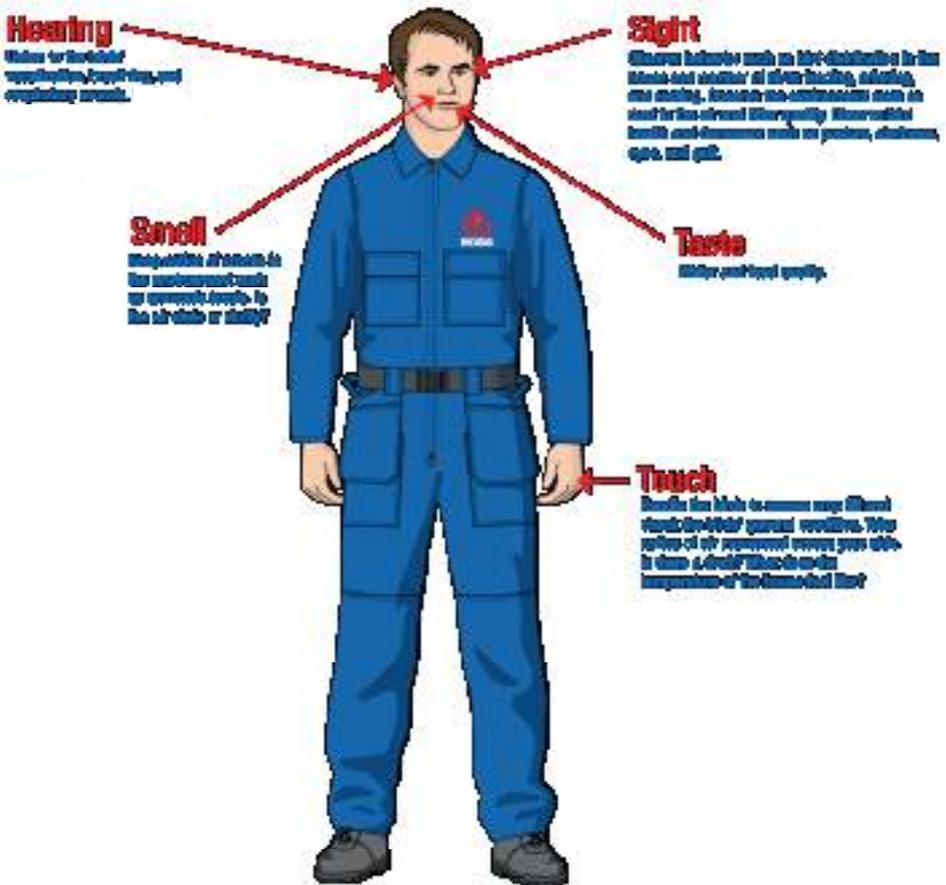
- Prepare, clean and disinfect houses and equipment well in advance of chick arrival.
- Ensure the house reaches the correct temperature and RH, with good air quality, at least 24 hours before chicks arrive.
- Ensure chicks have immediate access to fresh water and feed.
- Use chick behavior as an indicator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

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.

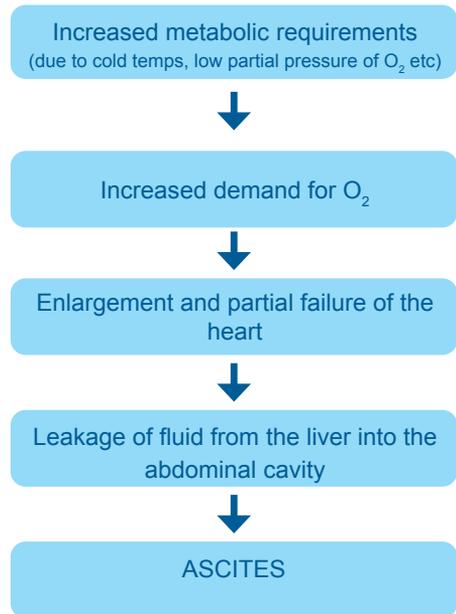
Ascites is a multi-faceted syndrome caused by interactions between physiological (e.g. O₂ demand), environmental (e.g. altitude) and management (e.g. ventilation, disease status) factors. Although Ascites may be most common (with substandard environmental conditions and poor brooding temperatures can 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.

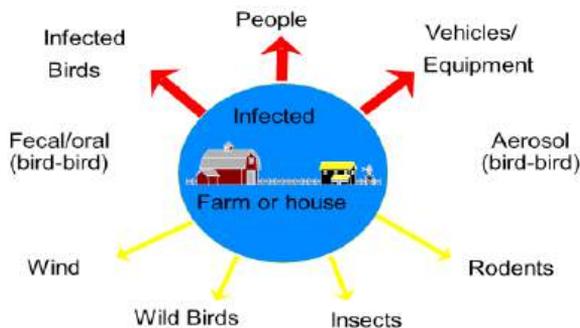
- Achieve appropriate ventilation in the poultryhouse from placement through to depletion is essential, particularly at high altitudes. Ventilation rates must supply enough air to replenish the oxygen consumed and ensure the adequate removal of waste gases.
- Prevent unnecessary increases in the birds' 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.

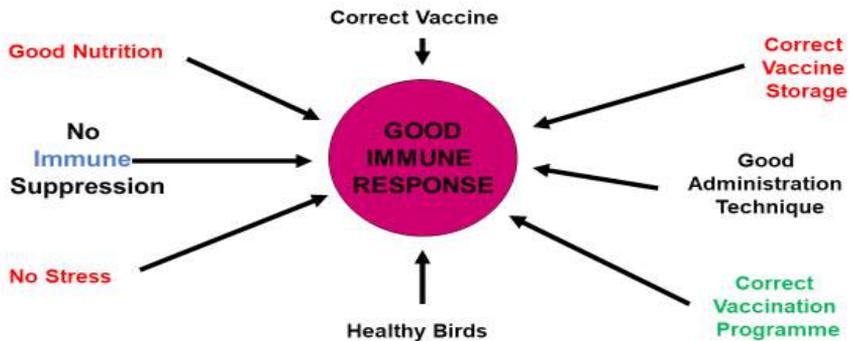
5 Steps to successful Cleaning and disinfection

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.

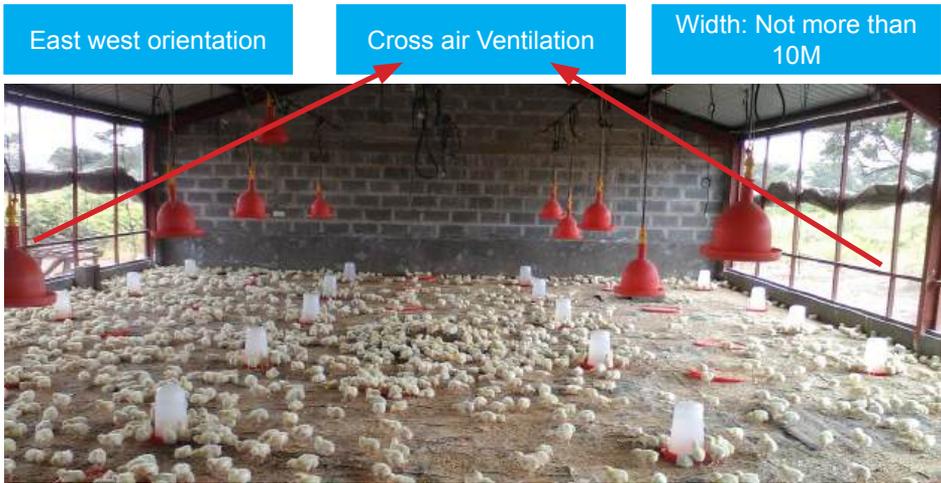
It is recommended that a multiage farm be cleaned of all litter and organic material, washed & disinfected with approved products and rested after disinfection for a minimum of 2-3 weeks on an annual basis (that is – no broilers on the farm).

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.



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.

Producers need to weigh their birds on a weekly basis to monitor their growth.



ROSS



NUTRI
FEEDS

ROSS BROILER PERFORMANCE

WEEK ONE	WEEKLY MORTALITY	CUMMULATIVE MORTALITY	AVERAGE WEIGHT GAIN
1	1	1	180g
2	0.5	1.5	450g
3	0.5	2	850g
4	0.5	2.5	1400g
5	0.5	3	2100g

RESULTS ACHIEVED UNDER AVERAGE MANAGEMENT ON A REGULAR BASIS IN OPEN SIDED HOUSES IN ZAMBIA

Are you achieving these?

To achieve these Results use

NUTRI
FEEDS

CONTACT DETAILS

ROSS BREEDERS DEPOTS

Waterfalls Depot	Nutri feeds Stand # 789936 Off Great East Road	0961-102 412
Chilanga Depot	Freedom compound along Kafue Road opposite freedom Bus station	0961-102 361
Showgrounds Depot	Lusaka Showgrounds Stand # CT3	0211 254 850
Chawama Depot	Lukama Investments Stand # 123/400 Chifundo Road	0961-102 360
Kamwala South	Sutizya mall Along Nationalist Road	0961-102 409
Lusaka West Depot	Nosh Complex stand # BP 26/24 Along Mumbwa Road	0961-102 519
Kafue Depot	Stand # 0255 Along Ulendo street next to Bata kafue Town	0961-102 413
Livingstone Depot	Stand # 4547 Mwela Road Opposite G4 Security	0961-102 517
Kitwe Depot	Shop # 34 Kabelonga Road Next to Company Clinic	0968-780 209
Chamboli Depot	Shop # A1 Ifisuma Shopping Complex 1st Street Chamboli	0960-186 771
Mongu Depot	Stand # 56 Along Independence Avenue Road Next Natsave Bank	0965-254 153
Meanwood Depot	Club Marilyn stand # 3 Along Airport Road	0965-254 415
Check point Depot	Stand # 21 Great North Road Before Kabangwe Check point	0965-254 133
Kalingalinga Depot	Calm loops Road Near Kalingalinga School ground	0961-836 122
Ibex Hill Depot	Stand # 1 Along Ibex Main street	0965-254 267
Kasama Depot	Tasha Lesa General Dealers Stand # 304 Along Mbala Rd near RA	0963-834 987
Kabwata Depot	Along Burma Road Kabwata Main Market	0963-916 953
Barlstone Depot	Prince Charlie complex After Eden University off Kasupe Rd	0961-836 425
Monze Depot	High view shopping center Shop # 3 off Lstone Rd	0963-916 887
Lilayi Depot	Lilayi Mall on Lilayi Rd	0968-210 105
Woodlands Depot	Chilenje Chris corner	0961-102 408
Soweto Depot	New soweto market	0965-254 274
Mimosa Depot	Ross Breeders Mimosa off Mimosa Rd	0966-685 152

LUSAKA RESELLERS

Pyramid Vet 10Miles	Mat Park Stand # 6 Along Kabwe Road	0977275332
Pyramid Vet Staililo	Staililo Shopping Complex Stand # 2 Along Great East Road	0977275332
Pyramid Vet Malambo	Malambo mall Stand # 2664 Malambo Road	0977275332
Pyramid Vet Kalingalinga	Kalingalinga mall Stand # 781996 Alick nkata Rd fridays corner	0977275332
Pyramid Vet Makeni	Rashid Shopping complex Stand # 29389 shop 6 Makeni Road	0977275332
Livestock Services	Along Pamodzi Drive Showgrounds	0977-753948
My vet	BMM Complex Stand # E5 Mungwi Road	0976-956945
Agrivet Africa	Stand # 8593 lumumba Rd Lusaka	0962-202849
Chick plus Makeni	Stand # 47/3/396A Along makeni Road	0979350000
Yielding tree	Stand # 176 Off Luanshua Road	0967289765
Sunlight Agro	Hematite Still premises Stand # 10524 shop 2 Along Lumumba Rd	0978400642
Cedar Agro	Kamangu Shops # 2 Along Mumbwa Road	0977227466
Chickmar Ent	Value village complex shop # 10 Along Great East Rd	0966728807
Chickmar Ent	Value village complex shop # 10 Along Great East Rd	0966728807
F A Chicks	F A Chicks Linda Next to Mango Inn Pub	0966739644
Makaas Ent	Lusaka Showgrounds stand # CT4	0971753239
ATS Retail Makeni	Stand # Off Kafue Road Opp Lamise Investments	0975745970
Kauzi Ent	Emasdale	0977927223
Darbyren Trading	Chazanga compound	0977109074
Farmers Animal feed	Kamwala	0955888824
Utendi Ent	Zingalume	0972153941
Chitengi Ent	Sangalala	0954598872
SM Kumbukani	Ngombe Foxdale zambezi Road	0977884228
YZ General Dearlers	Matero	0963796066
Nkuku Supplies	Chilenje	0968665622
Grandeur Ent	Chaisa Along Great North Road	0974751422
Hami General	Chirundu Along Chiyawa Road, Opposite Taxi Rank	0971168866
Hami General	Kafue Opposite Chikoswe Primary School	0973101876

RESELLERS IN EASTERN PROVINCE

ATS Retail Katete	Katete Trade Center stand # 842Mozambique Road Next to Pangwe Motel	0977145960
ATS Retail Petauke	Petauke Trade Center Stand # 2508 Omelo Mumba Road Near Chikowa Lodge	0977128564
ATS Retail Nyimba	Nyimba Trade Center along Great East First Shop Near Cargall Ltd	0961198512
ATS Retail Lundazi	Ats Lundazi Genary Stand # 1116 Off Chama Road Near Dunda Compound	0977988447
M C Sangwani Katete	Katete	0966996195
MC Sangwani Petauke	Petauke	0966996195
MC Sangwani Sinda	Sinda	0964695929
MC Sangwani Lundazi	Lundazi	0978181817
Zaulimi Chipata	Kamina street Down shops Stand # 515	0977745420
Comaco Chipata	Chipata	0979646477

OMNIA OUTLETS

Omnia Petauke	Petauke	0972767059
Omnia Katete	Katete	0960179718
Omnia 10 Miles	10 Miles	0960445963
Omnia Matero	Matero	0972762141
Omnia Soweto	Soweto Mumbwa Rd	0972764900
Omnia Chongwe	Chongwe Town	0961102406
Omnia Makeni	Makeni	0960445848
Omnia Mumbwa	Mumbwa	0972793676
Omnia Kabwe	Kabwe	0963916859
Omnia Kapiri	Kapiri	0960446457
Omnia Mkushi town	Mkushi	0965254158
Omnia Kitwe	Kitwe	0960445917
Omnia Mansa	Mansa	0974239614
Omnia Ndola	Ndola	0960446576
Omnia Choma	Choma	0968232125
Omnia Kasama	kasama	0960996756
Omnia Isoka	Isoka	0974239497
Omnia Mpika	Mpika	0960996758
Omnia Mbala	Mbala	0960446678
Omnia Kalomo	Kalomo	0960996725
Omnia Livingstone	Livingstone	0960446751
Omnia Serenje	Serenje	0963078202

RESELLERS IN SOUTHERN PROVINCE

Ats Retail Monze	Monze Trade Center stand # 460 L/stone Road Opp FRA Services	0972448470
Agrisure Mazabuka	Engine Filling station Stand # 167 next to Spar	0964587158
H W Ent	Mazabuka Fashions Stand 70 shop 4 next to Local bus stop Main st	0977864174
Acropolis Monze	Acropolis Building next to food Royal L/Stone Road	0967490038
Farmarama Choma	Stand # 346 A L/stone Road Next to Mutupa Milling	0962220600
Arupee Ent Choma	Stand # 337 L/stone Road town center Next to Puma	0977774705
Ats Retail Choma	Choma Trade Center Stand # 268 Cingani Road	0977889875
Cassia Agro	Monze	0977563047

RESELLERS IN CENTRAL PROVINCE

Mukango Kapiri	Mukango agric Stand # 497 Great North Road	0971717330
Farmarama Kapiri	Stand # 1 Along Great North Rd Opp Main Bus St	0962220651
Elemental Ent Kabwe	Stand # 61 C Independence way Opp Mount Meru Filling St	0974042261
Mumbwa agro	Cashman Complex After Peps	0969871719
Farmarama Mumbwa	Farmarama Ltd Stand # 251 Old Kabwe Road	0978604340
ATS Retail Mumbwa	Mumbwa Trade Center Stand # 252 Old Kabwe Road	0977646491

AVIAN VENTURES OUTLETS

Kmb	Crn of Nyerere & Eshowe Rd	0967794211
Mufulira	Crn of Buteko & Chachacha St	0962074759
Chingola	Chingola	0967648673
Chillilabombwe	2nd Class Bus stop	0962020132
Solwezi	Main Rd,Next to CAT Offices	0969788115
Kalushi	Kabwe St ,Near Main bus stop	0969529301
AV Mansa Shop	Plot # 1 President Ave	0962210321
Kitwe Wusakile	Kitwe Wusakile	0962391113
Kitwe Chimwemwe	Kitwe Chimwemwe	0967255640
Lumwana	Lumwana	0962904852
Ndola Town Centre	Ndola Town Centre	0962887488
Ndola Masala	Ndola Masala	0962904150
Luanshya	Luanshya	0962904881
Chambeshi	Chambeshi	0960775208

RESELLERS IN COPPERBELT PROVINCE**NDOLA**

Stema	Opp Railway Station	0964552550
Stema	Opp Shoprite-town center	0967218576
Omnia Ndola	Ndola	0978037632

KITWE

Munyongo	Garnerton	0966783605
Swinney Ent	Main Market ,Kitwe	212222884
Stema	Chamboli	0967218576
Miseshi Stema	Near Old Airport Rd	0966375117
New Generations	Luangwa Market	0962024344

KASUMBALESA

John Livadias	Kasumbalesa Mkt	0969445814
John Livadias	Kasumbalesa Mkt	0977755110

MANSA

Joyous General Dealers	Next to Central Clinic gate down Market Mansa	0979950899
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WESTERN PROVINCE

Farmers Shop Sesheke	along Nakatindi Road next to National Milling	0761938590 / 0979635007
Patmans Business Solution	Senanga New Market next to Legette Bakery	0963884261

MUCHINGA PROVINCE

Three Brothers Investment Ltd	Along Great North Road near Atlasmara Bank Nampluma	0079566304
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