

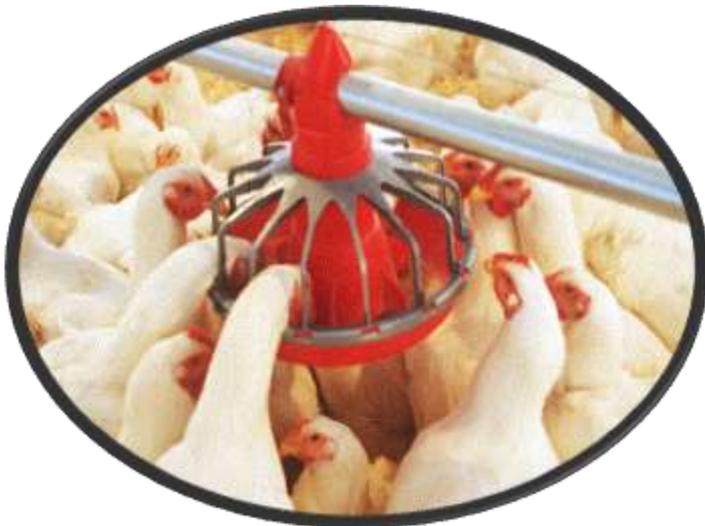
# FEEDING MANAGEMENT OF POULTRY

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# INTRODUCTION

India rank **3<sup>rd</sup>** in egg prodn. **4<sup>th</sup>** in broiler prodn.

Balanced diet  Genetic potential

**70% of total production cost**

Egg produced by a pullet in a year weigh **8** times of body weight

Increase body weight **3** times

Eat **20 times** of her body weigh in feed

**Needs Strategic feeding management**

  
**Sustainable poultry production**

# Six Major Classes of Nutrients

**Carbohydrates**

**Protein**

**Fats**

**Vitamins**

**Minerals**

**Water**



# POULTRY FEEDING

## 1-Energy requirement:

- Ration for poultry calculated on the basis of ME.
- Poultry eat to satisfy their energy needs when fed free choice
  - control the intake of all nutrients by including them in a definite proportion to available energy level.
- Cereal grains ~ principal energy sources.



# FEEDING OF LAYING HENS

## Fat supplement:

- Fat addition  $\Rightarrow$   $\uparrow$  energy density of feed
- Fat addition  $\Rightarrow$   $\downarrow$  amount of feed required / dozen eggs.
- Fat supplemented @ of 3-8%
- Used in summer: **Lowest SDA**



# POULTRY FEEDING

## 2- Protein requirement: Quality Protein

Require 11 essential AAs (**glycine** an additional aa).

- $\uparrow$  Temp.  $\Rightarrow$   $\downarrow$  feed intake  $\Rightarrow$   $\uparrow$  protein req.  
 $\downarrow$  Temp.  $\Rightarrow$   $\uparrow$  feed intake  $\Rightarrow$   $\downarrow$  protein req.

**Methionine** most important for egg laying

Some AAs can met by other AAs:

Cystine  $\Rightarrow$  methionine, Tyrosine  $\Rightarrow$  phenylalanine Glycine  $\Rightarrow$  Serine

Overheating or underheating during processing ~  
affect the availability of some amino acids.

- Protein req. proportional to the energy level in the ration.
  - **Calorie protein ratio**

# PROTEIN SUPPLEMENTS:

- Protein source added to provide the essential AAs.
- Several protein sources ~ **Better Biological Value**

## A. Vegetable Protein source:

- Soybean meal is most common plant protein source
  - Better balance of AAs than other plant protein
- G.N.C, sunflower cake, cotton seed cake, linseed meal etc.

## B-Animal protein:

- Fish meal, meat by-products, blood meal, feather meal
- Fish meal have a good balance of AAs,
  - used at 2-10% to avoid fishy flavor in eggs & poultry meat.
- Meat and Bone meal ~used in commercial pellet



# MINERAL REQUIREMENTS

**Macro minerals:** Required in larger amounts in the diet.

**Calcium**

**Chlorine**

**Magnesium**

**Phosphorus**

**Potassium**

**Sodium**

**Sulfur**

**Micro or Trace minerals :** Required in very small amounts in the diet.

**Cobalt**

**Copper**

**Fluorine**

**Iron**

**Iodine**

**Manganese**

**Molybdenum**

**Selenium**

**Zinc**



# **MINERAL REQUIREMENTS:**

- ❖ **Minerals ~inorganic nutrients .**
- ❖ **Bones are formed of Ca & P**
- ❖ **Egg shells are mainly composed of calcium.**
- ❖ **Construction of muscles**
- ❖ **Construction blood cells**
- ❖ **Construction of internal organs & enzymes.**
- ❖ **Poultry fed with mineral deficient diets:**
  - ❖ **Never develop properly**
  - ❖ **Poor performance (growth and egg prodn.)**
  - ❖ **Poor feed efficiency**
  - ❖ **More susceptible to disease.**



## Calcium:

- Broiler chicken require 1.2% Ca
- Laying birds need large amounts of Ca (3%)  
Egg shells composed entirely of  $\text{CaCO}_3$
- Bird stored Ca for about 10-14 days before the first egg was laid in the marrow of long bone.
- ↓ Ca in laying ration ⇒ ↓ egg production & egg shell weak & ↓ hatchability.

## Ca supplements:

Ground oyster shell, limestone, bone meal, dicalcium phosphate.



# CALCIUM FEEDING

- ✓ Egg shell ~calcium carbonate
- ✓ Development of the medullary bone ~reservoir of calcium
- ✓ **Pre lay feed for the 2wk before 2 % production. 2-2.5% Ca at 16 wks of age**
- ✓ Osteoporosis & Cage layer fatigue, shell less eggs
- ✓ **2-4 mm shell grit particle size**
  - ✓ retained in the digestive tract and dissolved slowly during the shell formation
- ✓ Half of the Ca should be supplied in coarse particle
  - ✓ Early maturing pullets may select their Ca need
- **The recommended ratio Ca : P<sub>av</sub> in diet of poultry is 1.2:1 (range 1:1 to 1.5:1)**  
**For laying hen 6:1 (Ca for bone & shell formation)**
- **↑ Ca in diet ⇒ ↓utilization of Mg, Mn & Zn.**



# PHOSPHORUS: (0.5% AV. P)

- **Animal Protein supplement (meat meal, tankage, fish meal) usually rich in phosphorus.**
- **Plant protein should supplement with P & Ca.**
- **Inorganic P is more available than phytate P.**
- **Phytate P: 40% of P from plant origin (wheat bran & rice bran) is available.**
- **Phytase enzyme improve P utilization**
- **Inorganic P supplied by bone meal, dicalcium phosphate, rock phosphate.**



# POULTRY FEEDING

## B- Salt (NaCl):

- The recommended level in the ration 0.5-1% of the ration.
  - Adult poultry can tolerate much higher inclusion but the water consumption increased.
  - Deficiency:
    - Increased feather pecking
    - decline in egg production
  - Excess dietary salt intake
    - wet droppings and wet litter.
      - Coccidia
  - Feed ingredients, fish meal, meat meal contain high levels of Na. When such ingredients are used, the level of supplemental (NaCl) in the diet must be reduced.
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# POULTRY FEEDING

## C- Manganese:

- Def. of Mn cause perosis with slipped tendon.
- Mn needed for egg production & hatchability.

## D- Iodine:

- Iodine included at rate of 0.5mg but when fish meal included at 5-10% no need iodine suppl.

## E- Magnesium:

- No Mg Suppl. Needed for poultry ration.
- ↑ Mg in diet ⇒ laxation

# Vitamin supplements:

- Natural feedstuffs provide some vitamins for poultry.
- Vitamin premixes are commonly used to provide the required vitamins in poultry.

- Routinely supplemented

- Water soluble

- B-complex vitamins

- Fat soluble

- A, D, E and K



# VITAMIN REQUIREMENTS:

## A- Vitamin A:

- **Vit.A is needed for normal growth & health.**
- **Def. Symptoms:**
  - Retardation of growth
  - Emaciation
  - Staggering gait
  - Ruffled feathers
  - Reduced immunity
- **Sources:** fish liver oils & other animal sources.

## B- Vitamin D:

- **Vit.D required for bone formation, egg production, reproduction & prevention of rickets.**
- **Def. symptoms:**
- **poor growth, lameness & rickets.**
- **Poultry do not get exposure to sunlight, ration must suppl. with vit.D.**

# POULTRY FEEDING

## C- Vitamin E:

- **Vit.E in ~ Immunity & Prevention of Peroxidation**
- **Vit.E essential to prevent encyphalomalacia or crazy chick disease.**

## D- Vitamin K:

- **Def. of vit.K  $\Rightarrow$  delay clotting time of the blood & produce serious hemorrhage**
- **All mixtures should be suppl. With vit.K**
- **Treatment by sulfonamide  $\Rightarrow$   $\uparrow$  vit.K req.**

# POULTRY FEEDING

## E- Thiamin ( $B_1$ ):

- Def. of thiamin  $\Rightarrow$  nerve deg., convulsion & heart abnormalities

## F- Riboflavin ( $B_2$ ):

- Def. of vit. $B_2 \Rightarrow$  curled-toe paralysis,
  - dwarfism & degeneration of nerve trunks.

# POULTRY FEEDING

## G- Niacin:

- Def. of niacin  $\Rightarrow$  inflammation of tongue & mouth cavity (black tongue).

## H- Vit.B<sub>12</sub>:

- Animal proteins are good sources of vit.B<sub>12</sub>.
- Def. of vit.B<sub>12</sub>  $\Rightarrow$  irritability, poor feathering & poor hatchability.

# VITAMIN DEFICIENCY DISEASES OF POULTRY



- 1 Vitamin A- Nutritional Roup (
2. Vitamin E- Muscular Dystrophy
3. Vitamin K- Bleeding Disease
4. Encephalomalacia-
5. Pantothenic acid- Chick Dermatitis
6. Vitamin B<sub>2</sub>- Curled toe paralysis
7. Vitamin B<sub>1</sub>- Star Gazing
8. Vitamin D- Ruffled feathers

# POULTRY FEEDING



## 6. Water:

- ❖ **Cheapest nutrient.**
- ❖ **Provides the basis for all fluid in the animal's body.**
- ❖ **Used in the blood supply.**
- ❖ **Digestion requires moisture for the breakdown of nutrients.**
- ❖ **Needed in the movement of feed through the digestive track**
- ❖ **Some medications are administered in the drinking water.**
- ❖ **Flushing the animal's body of waste.**
- ❖ **Regulate the animal's body temperature.**
  
- **Water consumption affected by environmental temperature**
  
- **Bird drink about twice as much water by weight of feed consumed.**

# POULTRY FEEDING

## I. Broiler chicken (meat type chicken)

Broiler starter (0-3 week)

Broiler finisher (4-6 wk -marketing)

## II. Layer (egg type chicken)

Chick (0-8wk)

Grower (9-20 wk)

Layer (20 wk -72 wks)

Phase I (20-40 wk)

Phase II (41-60 wk)

Phase III (61-72 wk)



# POULTRY FEEDING

Factors affecting feed intake:

**1-Energy levels in the ration:**

↑ energy level ⇒ ↓ feed intake

↓ energy level ⇒ ↑ feed intake

**2-Environmental temperature:(16-24°C)**

↑ Temp. ⇒ ↓ feed intake

↓ Temp. ⇒ ↑ feed intake

**3. Health of the bird**

**4-Genetics**

**5-Form of the feed**

**6-Nutritive balance of the diet**

**7.Stress**

**8-Body size**

**9-Rate of growth & egg production**



# POULTRY FEEDING

## Factors affecting feed efficiency

**1-Type of feed fed**

**2-Strain of the birds**

**3-Environmental temperature**

**4-Age and weight of the birds**

**5-Diseases and contaminations**

**6- Size of baby chicks**

**7-Antibiotics and medications**

**8-Debeaking**

**9-Feed wastage~ Rodent control in feeding area**

**10-Form of the feed**

# CHICKEN FEEDING

- ✓ **Poultry completely depend upon the dietary sources for all nutrients (essential AAs., vit. B groups & vit. K)**
- ✓ **Feed must contain all essential nutrients in right amounts & proportion (optimum Ca:P, Ly:Arg etc.)**
- ✓ **Different standards as per physiological stage should be followed.**
- ✓ **Include agro-industrial by-products~ to minimize cost of the ration**
- ✓ **Optimum level of ingredient inclusion~ as many of ingredients have a deleterious effect at higher levels.**
- ✓ **Judicious use of feed additive and supplements**

# **METHODS OF POULTRY FEED FORMULATION:**

## **1. By trial and error method:**

**Feed ingredients are interchange by trial and error until right combination is reached**

- The most practical**

## **2. Pearson square method:**

**This is simple easy and direct method.**

**Only one or two nutrient can be balanced at a time**

## **3. Algebraic equations**

## **4. By using computer/least cost formulation/linear programming**

## NUTRIENTS REQUIREMENTS FOR CHICKEN DM BASIS (BIS 1992)

<i>Characteristics</i>	<i>Chick (0-8 wk)</i>	<i>Grower</i>	<i>Layer</i>	<i>Breeder</i>
Moisture% (maximum)	11	11	11	11
CP % (minimum)	20	16	18	18
CF% (maximum)	7	8	8	8
Acid insoluble Ash % (max)	4	4	4	4
Salt + (NaI) % (max)	0.6	0.6	0.6	0.6
Calcium %	1.0	1.0	3.0	3.0
Phosphorus % (available)	0.5	0.5	0.5	0.5
Lysine %	0.9	0.6	0.65	0.65
Methionine %	0.3	0.25	0.3	0.30
Methionine+ cystine (%)	0.6	0.5	0.55	0.55
ME Kcal/kg	2600	2500	2600	2600
Calorie-protein ratio	130	156	144	140

## **NUTRIENTS REQUIREMENTS FOR CHICKEN DM BASIS (BIS 1992)**

<b><i>Characteristics</i></b>	<b><i>Chick (0-8)</i></b>	<b><i>Grower</i></b>	<b><i>Layer</i></b>	<b><i>Breeder</i></b>
<b>Linoleic acid g/100g</b>	<b>1.0</b>	<b>1.0</b>	<b>1.0</b>	<b>1.0</b>
<b>Vit A IU/Kg</b>	<b>6000</b>	<b>6000</b>	<b>8000</b>	<b>8000</b>
<b>Vit D<sub>3</sub> IU/Kg</b>	<b>600</b>	<b>600</b>	<b>1200</b>	<b>1200</b>
<b>Vit E , IU/kg</b>	<b>10</b>	<b>10</b>	<b>10</b>	<b>20</b>
<b>Thiamin mg/kg</b>	<b>5</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>Riboflavin mg/kg</b>	<b>6</b>	<b>5</b>	<b>5</b>	<b>8</b>
<b>Manganese mg/kg</b>	<b>90</b>	<b>50</b>	<b>55</b>	<b>90</b>
<b>Zinc mg/kg</b>	<b>60</b>	<b>50</b>	<b>75</b>	<b>100</b>
<b>Iron, mg/kg</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>
<b>Iodine, mg/kg</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>
<b>Copper ,mg/kg</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>

# MAXIMUM INCLUSION LEVEL

Ingredients	Inclusion level %	Ingredients	Level of inclusion (%)
Maize	60	Rice .Polish	10-30
R.P (Deoiled)	10-20	Wheat Bran	10-15
Molasses	0-5	Animal & Veg. fat	10
Rice bran	10-20	D.O.R.B	10-20
G.N.C (deoiled)	20	G.N.C	40
Soya bean meal	40	Sesame meal	20
Linseed meal	04	Linseed meal	4
M.O.C	10	Fish meal	10
Meat meal	10	Meat & bone meal	05
Blood meal	03	Silk worm Pupae meal	6
Sunflower cake	10-20	Sorghum (Jower)	10-20
Bajra	10-20	Oats	10-20
Wheat	50	Lucerne meal	5
Maize gluten	0-10	Fat	2-3
Cotton seed cake	0-10	Salt	0.5%
Mineral mixture	2.0%	Lime stone	3.0 (layer)

# FEED FORMULATION

## Points to consider:

**I. Nutritional requirements- BIS,NRC, ARC**

**II. Availability of feed ingredients-** Locally & easily available

**III. Cost of feed ingredients - Low cost**

**III. Non-nutrient characteristics of feeds:**

Free of anti-nutritional factors

**IV. Inclusion level of feed ingredients:**



# FEEDING OF LAYING HENS

## Feed preparation:

- **Mash**
- **Pellets**
- **Crumbles**



Less wastage when using pellets or crumble

- Poultry grow faster



# FEEDING OF LAYING HENS

## Feeding systems:

1-Whole grain method

2-Grain & mash

3-All mash: fed at first 8W

4-Wet mash feeding (more palatable)

5-Pellets

- With grain fed must used insoluble grit
- Also fresh green feed is fed to poultry.



# FEEDING OF LAYING HENS

## Layer (egg type chicken)

**Chick (0-8wk)**

**Grower (9-20 wk)**

**Layer (20 wk -72 wks)**

**Phase I (20-40 wk)**

**Phase II (41-60 wk)**

**Phase III (61-72 wk)**



# FEEDING OF LAYING HENS

## Stage of egg production:

- Egg production hen usually cover a period of 15 months
- Commences at 22W of age  $\Rightarrow$  peak at 28-30W of age  $\Rightarrow$  gradually decline to 65% after 15 months of lay.
- $\uparrow$  lighted period  $\Rightarrow$   $\uparrow$  feed intake &  $\uparrow$  stimulation of pituitary gland  $\Rightarrow$   $\uparrow$  egg la



# Phase-feeding of laying hens:

First proposed in the 1960s by Dr. G.F. Combs

Adjust nutrient intake with the rate of egg production

**A-Phase I (most critical period):**

During 20 W period (22-42 W of age) pullet

CP Req. ~ 18%

↑ Egg production from zero to peak (85-90% production).

↑ ↑ egg size from 40g/egg at 22W to over 56g/egg at 42W of age



# FEEDING OF LAYING HENS

## B-Phase II :

- The period ranged from 42-62W of age.
- Hens attained mature body weight
- Egg production: 70- 75%
- CP Req. ~ 16%

## C-Phase III :

- Period after 62W of age.
- Egg production: <60%
- CP Req. ~ 15%



# FEEDING OF LAYING HENS

## Forced Feeding:

- Applied in poultry if feed and water are denied for more than 36 hours to prevent dehydration and save life.
- Mash water mixture, skim milk, hydrolysable protein, medicine etc. can be used.
- Rubber catheter or smooth tube may be applied to force the slurry down the gullet below the wind pipe entrance.



## SEPARATE-SEX FEEDING

- Feeding separate male and female birds, a practice called separate-sex feeding.
  - Since male broiler chickens grow faster, they often are reared separately from the females until they are moved into the breeder house.
  - There will be more uniformity among males and among females in the flock.
  - Separation of the birds also allows producers to feed diets that more closely meet the nutritional needs of the male and female birds.
- 

# RESTRICTED FEEDING:

- **Method of feeding where time, duration and amount of feed are limited.**
- Adolescent birds, when given the opportunity, will eat until they become obese.
- Restricted feeding is necessary if the birds are going to be used as breeder stock.
- The obesity severely limits the numbers of eggs laid and the fertility of eggs.

**Quantitative:** Limiting the amount of feed daily given to the animals

**Qualitative:** Related to nutrient dilution in the diet

- **During the growing period (8-20 wk)**
- **20-30% restriction of feed**
- **Not practiced during disease**



# FEED RESTRICTION METHODS:

## Physical Feed Restriction

Physical feed restriction supply a calculated amount of feed per bird, which is often just enough to meet maintenance requirements.

It is necessary to provide sufficient feeder space in order to prevent competition among restricted birds and to prevent unequal growth of birds within a flock.

### **Problem:**

Practical *application of physical feed restriction is not simple due to the problems of regularly weighing birds and calculating feed consumption on a daily basis.*

# RESTRICTED FEEDING:

## **Skip-a-day Feeding:**

Skip-a-day deprivation of feed is a technique for restricting early growth.

Commonly used in broiler breeder's growth restriction.

- Skip-a-day feed decreases early growth and reduce the incidence of ascites without affecting final body weight



# RESTRICTED FEEDING:

## Lighting Programs:

- **Birds are very sensitive to light**
- **Light intensity, color and the photoperiodic regime can affect the physical activity of pattern within a flock.**
- **Poultry under different reduced lighting programs will reduce their feed**



# RESTRICTED FEEDING:

## Diet Dilution:

- In this method diets are mixed with non-digestible ingredients such as fiber and so are of reduce nutrient density.
- Dilution with rice hulls in order to retard early growth.
- Reduced body fat deposition.



# RESTRICTED FEEDING:

## Use of Low Protein or Low Energy Diets:

- Retard growth rate
- Results into less lipid gain but maximize lean mass production
- Live weight and feed conversion
  - Will be negatively affected
- Cost per lean mass will be optimal
- **Advantage:**
  - Does not need any additional labour of weighing the feed



# EFFECTS OF RESTRICTED FEEDING:

## Metabolic Diseases:

Early fast growth in modern broilers is associated with increased stress on the birds and can result in metabolic diseases (Ascites) and skeletal disorders:

## Benefits of Feed Restriction:

- Delay Sexual Maturity
- Increase egg size
- Uniform egg size
- Lower layer house mortality
- Increase profit
- Improved feed conversion
- Decreased Ascites
- Decreased Sudden Death Syndrome
- Decreased Leg Disorders



# FEEDING MANAGEMENT DURING HEAT STRESS

- Heat stress affects feed intake adversely
- A rise in temperature by 1° C results in a decrease of feed intake by 2.43 g per hen
- **General feeding management to alleviate heat stress:**
  - Feeding during early morning and late evening.
  - Feed should always be fresh and not be stored for longer than two months, in summer to reduce the possibility of mycotoxin build up.
  - Dim the lights while feeding, in order to reduce activity and hence minimise heat load on the birds.
  -

## Feed form

- Offering pelleted feed to broilers can result in a 67% reduction in the energy required for eating.
  - Broilers with high quality pellets with the minimum amount of fines reduces the proportion of energy wasted in acquiring feed.
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# FEEDING MANAGEMENT DURING HEAT STRESS

## ○ Dietary fat

Inclusion of fat in diets for heat-stressed broilers helps improve feed intake and performance, because of the lower heat increment of fat compared to other energy sources such as carbohydrates or proteins.

- Fat sources having large amounts of polyunsaturated fatty acids, such as soybean oil, flaxseed oil should all be avoided. Such sources are susceptible to oxidative rancidity and destruction of vitamin A and E.

## Minerals and vitamins

- Mineral and vitamin excretion increases at higher environmental temperature.
- Further supplementation of diets with minerals and vitamins required.
- Maintenance of both carbon dioxide and blood pH is critical to the heat-stressed broiler and the addition of ammonium chloride and potassium chloride to the drinking water to maintain this balance
- The addition of extra vitamins and electrolytes to the drinking water.
- Use of ascorbic acid in the feed or in the drinking water



# FEEDING MANAGEMENT DURING HEAT STRESS

## ○ Water supply

Heat-stressed birds dissipate over 80% of their heat production via evaporative cooling. The evaporative heat dissipation extent and calories dissipated per breath are correlated with water consumption level.

- Increasing water consumption by 20% over the basal level can increase heat loss per breath by as much as 30%, with a resulting improvement in performance.
- Increase water space by 25% .
- Water consumption could also be increased by using water troughs in place of nipple or bell-type drinkers. With such a system birds would also have the chance to submerge their heads and combs in water to reduce the heat load by evaporation of water from these body parts.



# DIETARY ELECTROLYTE BALANCE (DEB)

- The dietary electrolyte balance (DEB) is more critical at high temperature than at normal temperature.
- Supplementing diets with Ammonium chloride ( $\text{NH}_4\text{Cl}$ ) (0.3-1%) + Sodium bicarbonate (1-2%) is helpful.
  - Ammonium chloride reduces blood pH and Sodium bicarbonate prevents excessive acidosis.
  - Sodium bicarbonate 1gr/Litre.....may be used
- The addition of extra vitamins and electrolytes to the drinking water is also helpful.
- Use of ascorbic acid (Vit C 400 mg/ L water) in the drinking water.



# POINTS TO CONSIDER

## Feeding Behaviour

- ✓ Naturally Grain eater
- ✓ Feeding during morning and evening

## Quality of Feed:

**Energy density** ~ Eat to fill their crop

**Protein Quality** (limiting amino acids)

**Calcium and Phosphorus**

## Fibre Level & Common salt level in feed

**Feather picking / Cannibalism**

## Don't forget the quality water

Higher Feed intakes day should be avoided

- ✓ **Fatty liver syndrome.**

## Use of Feed additive and Supplements

# RECENT ADVANCES

## Use of feed additives and supplements

- ❖ Antibiotic growth promoters
- ❖ Probiotics
- ❖ Prebiotics
- ❖ Synbiotics
- ❖ Eubiotics
- ❖ Enzymes
- ❖ Organic acids
- ❖ Nucleic acid
- ❖ Antioxidant
- ❖ Mycotoxin binders
- ❖ Phytobiotics
- ❖ Immunomodulators

**THANK YOU**

