

# **Economic Feed Formulation and Feeding of Layers**

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## **Layer industry: fast growing segment**

- **Annual growth rate: 6% in egg**
- **Estimated egg production: 73 billions (3.52 million MT egg mass, 2014-15)**
- **India ranks third in egg production**
- **Per capita availability 58 eggs/head/year**
- **Requirement: 180 eggs/head/year (3X)**

# Constraints and challenges

- ❖ **Feed Cost (Rs. 2.35/egg)**
  - ❖ **Emerging of new diseases**
  - ❖ **Re-emerging of existing diseases**
  - ❖ **Fluctuations in market price of eggs**
  - ❖ **Animal welfare & Clean environment**
- 
- ✓ **Feed accounts 70-75% (Rs. 2.35+Rs. 0.80) of egg production**
  - ✓ **Major means of reducing production cost**

# **Feed-cost efficient poultry production**

- **Precise nutrients supply (balanced ration)**
- **Using low cost feed ingredients**
- **Augmenting nutrient utilization**

**Processing**

**Supplementation of micronutrients**

**Augmenting gut health**

- **Use of suitable feed additives**
- **Effective feeding management**

# Nutrition of starting & growing chicks

- 300 –310 eggs to 315-325 eggs/year
- 10-15 eggs during 16-20 wk
- Sexual maturity 16-18 wk against 20 wk earlier
- Peak production 24-26 wk against 26-28 wk
- Body weight at 16 (1200 g)-18 wk (1350 g) age
- Feed intake- Dietary energy concentration
- **Good start –better return**

# Uniform body weight at sexual maturity

- Chicks of uniform body weight
- Improper mixing of feed
- Pellet vs. mash feed
- No. of feeders & waterers

# Body weight at sexual maturity

## Target weight

- 6 wk-450 g
- 12 wk-900 g
- 16 wk: 1200g
- 18 wk- 1350 g

**Optimum adult body weight: 1350-1600g**

# Phases of growing egg type chickens

- **Conventional rearing:**
- **Starter: 0-8**
- **Grower: 8-16**
- **Pre-laying: 16-18**
- **Be reared: 0-6, 6-12, 12-16 and 16-18wk**
- **Several Stress during growing period**
- **Good feeding & nutrition**



# Limiting

- **0-6 weeks: Protein, minerals**
- **6-12 weeks: Protein & energy**
- **12-16 weeks: Energy**
- **16-18 wk: Calcium, energy & protein**
- **18-28 wk: Calcium, energy & protein**
- **Summer hatched chicks**

# Feeding phases of layer production

- **Phase 1 (16/18-35 wk) :**
- **Phase 2 (35-50 wk):**
- **Phase 3 (>50 wk):**
  
- **Can be fed in more number of phases**

# Egg type starter & grower ration

	0-8 wk	8-16wk	16-18wk
<b>ME</b>	<b>2750</b>	<b>2650</b>	<b>2700</b>
<b>CP, %</b>	<b>18-20</b>	<b>15.0</b>	<b>16.0</b>
<b>Lys, %</b>	<b>0.85</b>	<b>0.62</b>	<b>0.65</b>
<b>MET, %</b>	<b>0.31</b>	<b>0.28</b>	<b>0.28</b>
<b>Met+Cys, %</b>	<b>0.63</b>	<b>0.50</b>	<b>0.52</b>
<b>Thr %</b>	<b>0.68</b>	<b>0.56</b>	<b>0.48</b>
<b>Calcium, %</b>	<b>0.85</b>	<b>0.85</b>	<b>2.00</b>
<b>Av. P.</b>	<b>0.45</b>	<b>0.37</b>	<b>0.35</b>

## Energy requirement (kcal/d/hen)

B. wt>	1400 g		1500 g			1600 g		
Egg mass	45 g	50 g	45g	50 g	55 g	45 g	50g	55g
10° C	292	305	301	313	327	309	322	335
15° C	282	295	290	303	316	298	311	324
20° C	271	284	279	292	305	286	300	313
25° C	260	275	270	285	295	280	290	300
30° C	250	265	260	275	285	270	285	290
35° C	240	253	250	265	275	260	275	280
40° C	230	243	240	255	265	255	265	270

Requirement /Feed intake= ME value of diet

Req: 300 kcal/110g=2727 kcal ME/kg

# Energy Requirement

**Additional 2.5 kcal/g egg mass**

**After 40 weeks reduce 10 kcal (?)**

**2 kcal/°C change in temperature**

**Add 1 kcal/10 g b. wt.**

**Adjust ME of diet as per intake**

# Ideal protein concept-layers

- Fix the dietary protein requirement (18 g CP)
- Lysine required= CP x 0.046 = 18 x 0.046= 0.828 g/d
- **Methionine req.= 43.5% of lysine=.435 x 0.828=0.360 g**
- Methionine +Cystine req= 84.9% of Lysine = 0.582 g
- Threonine requirement= 68.6% of lysine=0.568 g
- Arginine requirement= 102.3% of lysine =0.850 g
- Tryptophan requirement= 22.73% of Lysine= 0.190 g
- Protein can be reduced up to 10% supplementing synthetic amino acid to meet EAA profile
- **Methionine**

## Daily requirements of layers (g/bird)

Age, week →	18-26	26-36	36-56	56>	Min.
Protein, g	18	17.5	16	15.5	15
Lysine, mg	880	800	700	680	600
Methionine, mg	380	350	310	300	280
Arginine, mg	900	820	715	690	690
Threonine, mg	600	560	480	470	450
Tryptophan, mg	200	185	160	160	160
Calcium, g	3.8	4.0	4.0	4.0	3.5
Av. P, mg	400	380	350	300	280
Linoleic acid,g	1	1	1	1	1
Choline, mg/kg	1200	1100	1050	1000	1000

# Use of alternate feedstuffs

Maize

Soybean

Locally available low cost quality  
ingredients



Cereals	Inclusion (% of diet)	Remarks
Maize	72	Can be added at any level to meet requirements of energy.
Broken wheat	50	New wheat is to be restricted, coarsely ground.
Broken rice	40	Must be free from moulds
Bajra	50	Its use should be restricted in summer
Jowar (white)	50	Should be coarsely ground, kharif jowar quality may not always be good
Jowar (brown)	30	Should be coarsely ground
Jowar, (red)	15	Should be coarsely ground
Barley	20	Use is limited

Rice kanki	40	
Rice polish (full fat)	25-40	Susceptible to rancidity on storage
Naku	20	Generally contains 5-7% bran/husk
Rice bran (oil 12-18%)	20	Susceptible to rancidity on storage & may contain aflatoxins
Rice bran (de-oiled)	15-30	Act as filler in diet of egg type
Maize gluten meal	3-5%	Protein 50-65% and good colour
Maize germ cake	5-10	Protein 21.5-22.5%, rich in methionine
Maize germ meal	10-15	Protein 12-12.5%, Oil 46%.
Rice gluten	5-7.5	Protein 44-50%, good source of methionine
Dried distillery grains with solubles (DDGS) – rice based	5-7.5	Protein 42-60%, good source of methionine
Dried distillery grains with solubles (DDGS) – maize based	2-3	Protein 32-35%, gives offensive smell.

## Oilseed by-products and meals

Soybean meal (roasted),	40	45% Protein
Soybean meal (roasted),	40	50% Protein
Groundnut oil meal	35	May contain aflatoxins,
Mustard/rapeseed meal (exp.)	3-5	May contain glucosinolate
Mustard/rapeseed meal (solv. ext.)	10-15	May contain glucosinolate
Sesame oil meal	15	Rich in phytate
Sunflower meal (decorticated)	20	Fibre is the major limitation
Sunflower meal (un-decorticated)	5-8	
Linseed oil cake	3-4	Designer egg
Cotton seed oil cake (undecorticated, gossypol free)	10	Cakes with less than 0.04% gossypol
Cotton seed oil cake (decorticated gossypol free)	10-15	Cakes with less than 0.04% gossypol, Vulnerable to mycotoxin production.

Guar meal (raw)	5	
Guar meal (toasted)	10	
High protein roasted guar korma	2.5 (pellet) - 12.5 (mash)	Protein ranges from 48-55%
Peas	10	
Animal protein sources		
Fish meal	10	
Meat meal (sterilized)	10	May be restricted upto 5%
Meat cum bone meal (sterilized)	5	
Tarula yeast	5	
Blood meal	3	
Poultry by-product meal	2-5	
Hydrolyzed feather meal	8	
Silk worm pupae meal	5	
Dry skim milk	3	
Shrimp meal	5	
Fenugreek (roasted)	2.5	
Coffee seed meal	2.5	

## Leaf meals

Alfalfa meal	5	
Berseem meal	5	
Subabul leaf meal	3-5	3% in broiler and 5% in layer diet
Groundnut haulm meal	5	

## Miscellaneous

Molasses	5-7.5	
Cassava meal	5	
Animal fat (tallow, lard)	3	
Fish oil	2	
Vegetable oil	3	

## Feed supplements & additives

- **Supplements:** Mineral and vitamin supplements, liming amino acids (L-lysine hydrochloride, DL-methionine and threonine) and
- **Feed additives:** enzymes, prebiotics, probiotics, acidifiers, toxin binders, coccidiostat, liver tonic, essential oils, etc)

# Egg size

- Breed variation
- Normal size
- Large size
- Small size
- Death due to prolapsed reproductive organs

# Egg shell quality

- Sound (Normal)
- Thin Shelled
- Thick with pores & calcium deposition
- Shell less egg





# Calcium nutrition

- **Requirements**

- **Rate of lay**

- **Egg size**

- **Age of bird**

- **House temperature**

# Calcium Requirements

- Requirement: **3.8-4.5** g/bird/day

**<3.5 g/b/d: ↓Egg prod<sup>n</sup>, ↓ egg mass ↑ Feed:egg mass**

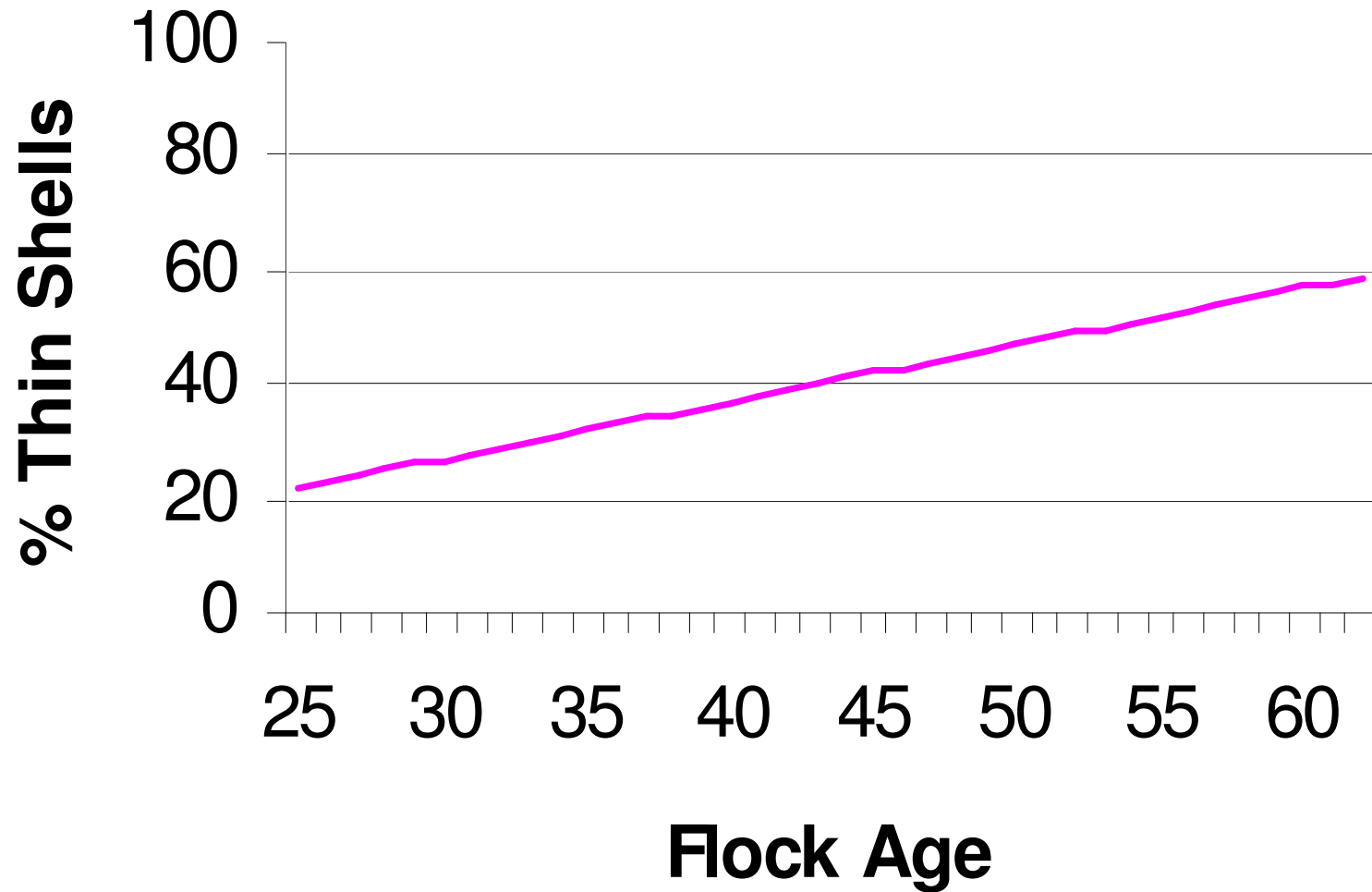
**>4.5g/b/d: ↓ shell wt, ↓ shell thickness, calcite deposition, ridge, ↑ incidence of shell porosity.**

**18-28 wk: 3.8g/bird/day**

**28-48 wk: 4.0g/bird/day**

**>48 wk: 4.2g/bird/day**

## Shell Quality and Flock Age



# Available P requirement

- Requirement:
- 250 –400mg (**285 to 320 mg**)/bird/d
- Optimum: **320 mg/bird**
- <250 mg/bird/day: ↓ feed intake, ↓ egg size
- >400 mg: ↓ egg shell thickness

## Av. P contents:

- Fish Meal 1.6 - 2.9% available P
- Meat-cum-bone meal 5 - 6 % available P

# Calcium nutrition-summer

- **Thin shell egg**

- Feed intake is reduced

- Calcium absorption is reduced

- Panting : CO<sub>2</sub> Loss & disturbed electrolyte balance (mortality)

# Remedies-Management:

**Temperature control (<30°C)/ Cooling**

**Birds Misting system**

**Proper ventilation**

**Reduce Ammonia concentration in shed**

**Prevent relocation of birds**

**Avoid scaring of birds**

**Feeding time – Dawn/cool period**

-

# Remedies: Calcium supply

- **Morning in feed (3.25%) & evening Top dressing (2 g CaCO<sub>3</sub>/b) at 3.00PM**
- **Particle size 1.0 mm > Av. 2.5 mm**
- **Ratio of fine to coarse particle:**
  - 20-40 wk: 50 : 50**
  - 40wk-60wk 40 : 60**
  - 60wk > 30 : 70**

**Add meat-cum-bone meal/fish meal in diet**

**Replace 50% of CaCO<sub>3</sub> grit by oyster shell grit**

# Remedies –other dietary changes

**Vitamin D<sub>3</sub> : 300 IU/bird/day or more**

**Avoid excess Phosphorus (285 mg/bird Av. P)**

**Avoid excess common salt (0.3% level)**

**Replace 50% common salt by sodium bicarbonate  
(0.17-0.50% in feed)**

**Avoid excess Manganese (30-40 ppm)**

**Encourage feed consumption**

**Reduce egg size: Decrease protein by 1.5-2 g**

**:Decrease methionine by 0.05%**

**: Reduce choline supplementation**



# Nutrition in heat stress

- **Encourage water intake**
- **Na<sub>2</sub>CO<sub>3</sub> in water (0.06-0.15%) stimulates water intake & improves egg shell quality**
- **Supply cold water (<25<sup>0</sup>C)**
- **Increase energy, lysine & methionine, vitamins & minerals to meet daily requirement**
- **Increase energy through fats/oils**
- **Vitamin C (250-300 mg/kg) increases livability**
- **Balance of Ca to P**

# Promising feed additives

**NSP enzymes- Unlock hidden energy, 2-3%**

- Decreased wet droppings
- Decrease layer house aroma

**Phytase: 500 phytase unit=0.125% av. P**  
**250 phytate unit/kg layer diet**

**Mycotoxin adsorbents**

**Organic acids**

**Antioxidants**

**Probiotics (mixture)**

**Herbal products (?)**

**Limitations: Quality control (?)**

# Designer poultry products

- **Growing public concern-eggs high in cholesterol (200-300 mg, average 250 mg)**
- **Poultry meat - more of saturated fatty acids and cholesterol**
- **Economical advantage-marketing low cholesterol eggs and meat with low fat**
- **Reduction of cholesterol content of egg yolk-**
  - 25% through dietary fat/energy**
  - 5-10% through dietary fiber**
  - 5-10% administration of certain drugs**
- **Commercially viable-50% reduction**

# Nutrition & egg quality

- Amino acids, vitamins & minerals can be improved by dietary manipulation
- Omega-3 fatty acids (linolenic, docosahexaenoic, docosapentaenoic, Eicosapentaenoic acid).
- Conjugated Linoleic Acid
- Iodine concentration
- Riboflavin concentration
- Vitamin E and other antioxidants like Se
- Incorporation of vitamin A.
- Egg is devoid of vitamin C.

# Feed intake (g)

Age (wk.)	Summer		Winter	
	Weekly	Cumulative	Weekly	Cumulative
1 <sup>st</sup>	85	85	85	85
2 <sup>nd</sup>	115	205	125	210
3 <sup>rd</sup>	150	360	180	390
4 <sup>th</sup>	190	550	230	620
5 <sup>th</sup>	220	770	280	900
6 <sup>th</sup>	280	1050	320	1220
7 <sup>th</sup>	320	1370	360	1580
8 <sup>th</sup>	370	1740	410	1990
9 <sup>th</sup>	400	2140	425	2325
10 <sup>th</sup>	420	2560	460	2785
11 <sup>th</sup> –12 <sup>th</sup>	900	3460	950	3735
13 <sup>th</sup> –14 <sup>th</sup>	950	4410	1050	4885
15 <sup>th</sup> –16 <sup>th</sup>	980	<b>5390</b>	1100	<b>5985</b>
17 <sup>th</sup> –18 <sup>th</sup>	1050	6440	1150	7085
19 <sup>th</sup> –20 <sup>th</sup>	1260	7700	1300	8385

# Feed intake during laying phase

- Breed variation
- Summer: 90-110 grams
- Winter : 110-130 grams
- Feed intake per egg: 122-125 grams

# Feed factors affecting FCR

- Use of perfectly balanced diet
- Dietary energy concentration
- Protein and amino acids balance
- Micronutrients deficiency
- Selection of feed ingredients for finished feed
- Fibre beyond 6 or 8% in mash and sand/silica beyond 3% in diets
- Use of feed additives
- Storage
- Optimum FCR; 122-125 g/egg

## Ingredients

Select Type of Feed

All

Enter the Name

s

Available Ingredients

43

Bajra  
Ragi  
Rice Polish  
Fat  
Oil  
Soybean Meal

Add >>

<< Remove

Ingredients in My Ration

3

Maize  
Jowar  
De-oiled Rice Bran

Ingredient Database

Refresh My Ration

Ingredients' Details

## My Ration (1000 kg)

Select Required Ration

Custom Ration

reqCP (kg)

230

reqME (MCal)

2900

reqCa (kg)

10

reqAP (kg)

5

reqLys (kg)

12

reqMet (kg)

5

Formulate My Ration

Show Final Result

## Readymade Ration (1000 kg)

Select Readymade Ration

Drailer Starter Ration 1

CP (kg)

230

ME (MCal)

2900

Readymade Ration





# Ingredient Database



Ingredient Name

**Maize**

Identification Number

1

Short Name

Maize

Type

Energy

Max Incl. Level (kg/100 kg)

70

Level (kg)

1

Cost (Rs/kg)

5

Crude Protein (g/kg)

100

Metabol. Energy (Mcal/kg)

3.4

Crude Fibre (g/kg)

25

Calcium (g/kg)

1.1

Total Phosphorus (g/kg)

4.5

Avail. Phosphorus (g/kg)

1.3

Zinc (g/kg)

0.014

Manganese (g/kg)

0.007

Lysine (g/kg)

3.5

Methionine (g/kg)

2.5

Cystine (g/kg)

1.8

Arginine (g/kg)

3.758

Tryptophan (g/kg)

0.589

Linoleic Acid (g/kg)

22

## Search Database

Select Field

Identification Number

Criteria 1

>=

Criteria 2

10

Show Record

Current Record No : 1

Total Records : 46



Thanks