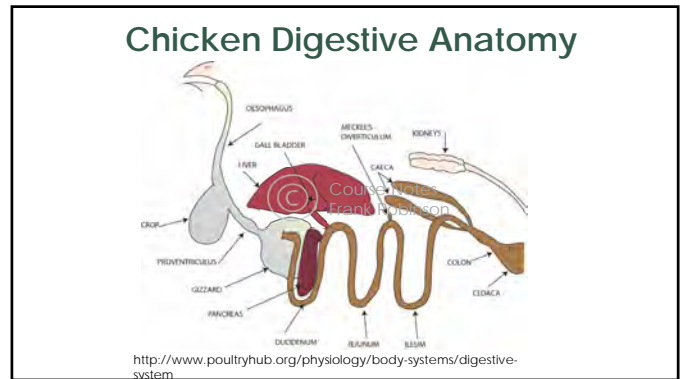




1



2

**Mouth / Beak**

- Birds do not have teeth
- Birds have very few taste buds compared to mammals

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<http://www.poultryhub.org/physiology/body-systems/digestive-system>

3

**Esophagus (anterior)**

- A tube connecting the mouth to the following parts of the digestive system

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4

**Crop**

- A pouch off the esophagus on the outside of the body cavity Serves as a feed storage site (helps birds become meal eaters)
- Of major importance to feed-restricted birds as they consume feed quickly and they store it here

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5

**Esophagus (posterior)**

- A tube connecting the crop to the following parts of the digestive system
- Lies inside the body cavity

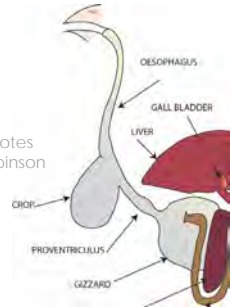
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6

**Proventriculus**

- The true “glandular” stomach.
- Feed does not stay in the proventriculus very long (just passes through) but there is some movement back and forth between sections of the digestive tract).

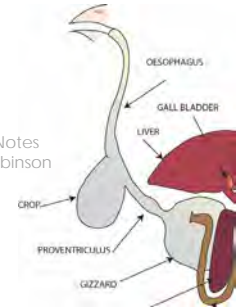


<http://www.poultryhub.org/physiology/body-systems/digestive-system>

7

**Gizzard**

- A muscular organ which serves to mechanically break down feed particles by grinding.
- The gizzard secretes a protective material (koilin) which forms a tough, resistant layer so that the gizzard does not injure itself by grinding.

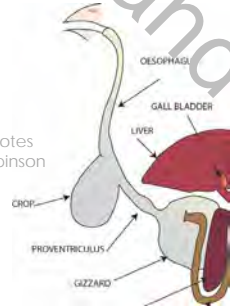


<http://www.poultryhub.org/physiology/body-systems/digestive-system>

8

**Gizzard**

- Birds with access to grit maintain these minerals in the gizzard to aid in this mechanical breakdown.
- Birds which are fed commercial mash, crumble or pellet-form diets do not need to carry out much grinding as the feed particles are ground finely.



<http://www.poultryhub.org/physiology/body-systems/digestive-system>

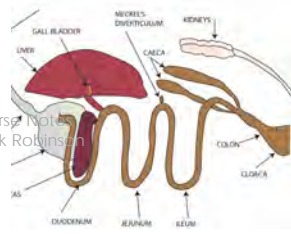
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10

**Small Intestine**

- The small intestine is the largest part of the digestive system of commercial poultry.
- There are three sections:
  - Duodenum
  - Jejunum
  - Ileum

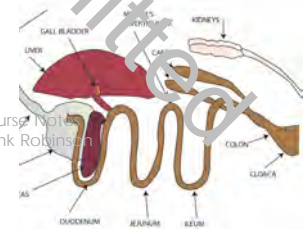


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11

**Small Intestine**

- Ducts from the gall bladder (bile ducts) and pancreas (pancreatic ducts) connect to the inside of the duodenum.
- This is the major site of nutrient digestion and absorption in chickens and turkeys.

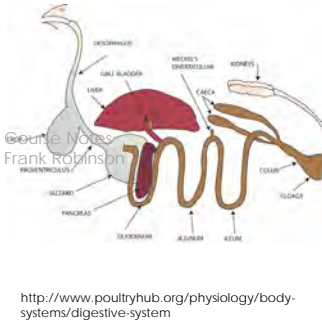


<http://www.poultryhub.org/physiology/body-systems/digestive-system>

12

**Ceca**

- A pair of ceca are long blind pouches at the junction of the small and large intestines
- Broody birds may greatly reduce feed intake and use their ceca to obtain nutrients from material present in the digestive system during the incubation period.

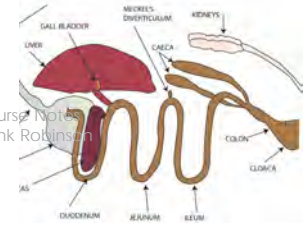


<http://www.poultryhub.org/physiology/body-systems/digestive-system>

13

**Large intestine (colon)**

- Chickens and turkeys have very short large intestines compared to mammals.
- This is reflected in the short time it takes feed to pass through a bird (4 – 8 hours) compared to mammals (approx. 24 hours or more).



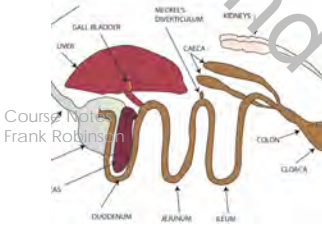
<http://www.poultryhub.org/physiology/body-systems/digestive-system>

<http://www.poultryhub.org/physiology/body-systems/digestive-system>

14

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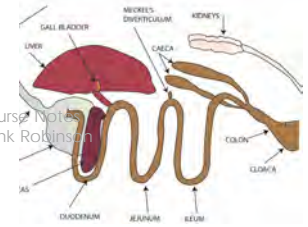
<http://www.poultryhub.org/physiology/body-systems/digestive-system>

<http://www.poultryhub.org/physiology/body-systems/digestive-system>

15

**Liver**

- Produces bile to assist in the digestion of fats
- Produces enzymes to break down proteins, carbohydrates and fats
- Constructs lipids which will become egg Storage of glycogen and fats
- Cleans body of some substances



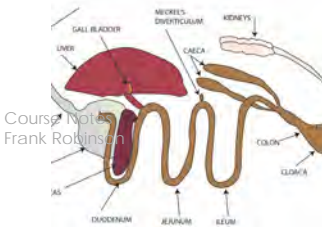
<http://www.poultryhub.org/physiology/body-systems/digestive-system>

<http://www.poultryhub.org/physiology/body-systems/digestive-system>

16

**Pancreas**

- Produces enzymes for the digestions of protein, carbohydrates and fats
- Produces hormones to maintain blood sugar levels at normal levels
  - Insulin decreases blood sugar levels
  - Glucagon increases blood sugar levels



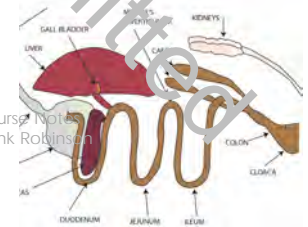
<http://www.poultryhub.org/physiology/body-systems/digestive-system>

<http://www.poultryhub.org/physiology/body-systems/digestive-system>

17

**Kidneys**

- A pair of kidneys lie in the upper back of the bird
- Remove toxins and waste products from the blood
- Urinary wastes are secreted in the form of solid uric acid, which represents the white material making up chicken feces



<http://www.poultryhub.org/physiology/body-systems/digestive-system>

<http://www.poultryhub.org/physiology/body-systems/digestive-system>

18



19



20



21

Nutrient Requirements	
Carbohydrates	Major energy source for poultry provided by cereal grains
Fats	Energy and essential fatty acids
Proteins	Needed for synthesis of body tissues, eggs, bodily processes, feather (are made up of amino acids)
Vitamins	Organic chemicals which control body processes and needed for health, growth and reproduction
Minerals	Inorganic elements which are required to control body processes and needed for health, growth and reproduction
Water	

22

**Sources and functions of carbohydrates in poultry diets**

- **Sources**
  - o Cereal grains (corn, wheat, barley)
  - o Availability may be increased by co-feeding enzymes to help break down some more complex carbohydrates
- **Functions**
  - o Main energy source in diet
  - o Support bodily function, maintenance, growth and egg production

23

**Sources and functions of fats in poultry diets**

- Sources**
  - Tallow (animal fats from the rendering process)
  - Plant oils (canola, corn, soybean)
- Functions**
  - Increase energy level
  - Control dust
  - Increase palatability (birds like it)
  - Vehicle for fat-soluble vitamins

24

**Sources and functions of protein/amino acids in poultry diets**

- Proteins are made up of 20 different amino acids  
 10 amino acids are essential to be added in the diet (the birds cannot make them in their system)

Methionine	Cysteine
Tryptophan	Threonine
Arginine	Histidine
Isoleucine	Leucine
Phenylalanine	Valine

- Support body function, maintenance, growth and egg production

25

**Sources and functions of protein/amino acids in poultry diets**

- Some amino acids are nonessential (the birds can make them at levels that support growth)  
 Some amino acids are nonessential (the birds can make them at levels that support growth from precursors in the diet)

**Sources**

- Plant (soybean meal, canola meal, corn gluten meal)
- Animal (meat meal, fish meal, blood meal)
- of tissues

26

**Sources and functions of vitamins**

**Key Vitamins**

- Fat soluble- A, D<sub>3</sub>, E, K
- Water soluble – B vitamins

**Sources**

- All are supplied as purified vitamins or as synthetic additives
- Are added to the diet as a pre-mix to improve mixing accuracy and ease of supplementation
- Usually provide more than the minimum needed levels as a margin of safety
- Some storage loss over time

27

**Sources and functions of vitamins**

**Functions**

- Support body processes
- Growth
- Egg production
- Chick production

28

**Important minerals and their functions**

**Macro minerals**

Calcium	Phosphorus
Salt (Sodium, Chloride)	

**Micro minerals**

Copper	Zinc
Manganese	Iron
Iodine	Selenium

29

**Important minerals and their functions**


**Functions**

- Bone integrity
- Body functions
- Egg shell quality

30

**Calcium, Phosphorus, and Vitamin D problems can cause significant problems:**

- Impaired shell quality (soft shelled, shell-less and misshapen eggs)
- **Cage Layer Fatigue**
  - Insufficient nutrients can result in hens using bone reserved of minerals for egg shell production
  - Bones can become thin with Calcium loss
  - Bone may break resulting in "downer chickens"
  - These birds should be culled as they will not recover from broken bones



31



**FIGURE 2.** Humerus of laying hen showing (a) normal pneumatized internal cavity and (b) cavity filled with medullary bone.

Course Notes  
 Overview of Bone Biology in the Egg-Laying Hen  
 C. C. Whitehead  
 Roslin Institute (Edinburgh), Roslin, Midlothian EH25 9PS, Scotland

32



**Oyster Shell**




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<https://www.peaveymart.com/>

33

**Grit**

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<https://www.peaveymart.com/>

34

Factors Affecting Nutrient Requirements	
<b>Genetics</b>	Species, breed, strain (nutrient partitioning)
<b>Age</b>	Body weight and stage of maturity
<b>Sex</b>	Differences after sexual maturity (growth rates and egg production)
<b>Reproductive Status</b>	Level of egg production
<b>Environment</b>	Cool temperatures increase requirements for maintenance, high temperatures decrease feed intake
<b>Housing System</b>	Floor housed birds use more energy
<b>Health Status</b>	Disease challenges may limit digestibility and increase some nutrient requirements

35

**Chicken Rations:**

- **Starter ration:** fed first few weeks to get birds off to a good start
- **Grower rations:** fed during the main growing period of meat-type birds
- **Finisher rations:** fed prior to ship-out for meat-type birds
- **Layer / breeder rations:** fed to laying hens as well as male and female broiler breeders with special emphasis on calcium metabolism to support egg shell development

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**Livestock Operation**

Type of Livestock: Cattle, Dairy, Poultry, Hogs, Horses, Goats, Sheep, etc.  
 Type of Grain: Barley, Corn, Oats, Wheat, Millet, Peas, Lentils, Pulses, etc.  
 Groove Pattern: 1 to 14 gpl. (Other groove pattern available)

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<https://www.apollomills.com/economill>

37

**ProForm Poultry**

This ProForm® Poultry Feeding Program is available at Hi-Pro Feeds' dealers residing

**Layer Birds for Eggs**

Age	Product ID	Product	Average Feed Intake
0 - 42 days	110021	21% Poultry Starter Medicated Crumbles	35 g/day
0 - 42 days	110041	21% Poultry Starter Crumbles	35 g/day
42 - 126 days/1 <sup>st</sup> egg	120081	16% Poultry Grower/Finisher Crumbles	70 g/day
Laying	130061	17% Complete Poultry Layer Short Pellets	110 g/day

**Broiler Birds for Meat**

Age	Product ID	Product	Average Feed Intake
0 - 28 days	110021	21% Poultry Starter Medicated Crumbles	75 g/day
0 - 28 days	110041	21% Poultry Starter Crumbles	75 g/day
28 days - market	120081	16% Poultry Grower/Finisher Crumbles	150 g/day

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<https://www.trouwnutrition.ca/siteassets/in-canada/lifestyle/proform-poultry-feeding-program--sherwood-park.pdf>

38

**COUNTRY JUNCTION FEEDS**

**LAYER SUPPLEMENT**

FEED FORM: Crumbles PRODUCT #: L20000  
 \*This feed contains added selenium at 1.2 mg/kg

**GUARANTEED ANALYSIS**

Item	Guaranteed	Actual
Crude Fat (Min)	8.0%	10.0%
Calcium (Actual)	19.0%	19.0%
Phosphorus (Actual)	1.0%	1.0%
Potassium (Actual)	0.8%	0.8%
Magnesium (Actual)	0.0%	0.0%
Sodium (Actual)	0.1%	0.1%

**FEEDING DIRECTIONS**

Feed the following suggested ratios as the sole ration. Country Junction Layer Supplement can be mixed with farm grains to produce a layer ration for non-commercial laying hens.

Layer Diet 1 (0 - 20 weeks)	Layer Diet 2 (20 - 52 weeks)
700 kg	400 kg
250 kg	250 kg
<b>Total 950 kg</b>	<b>Total 650 kg</b>

**FEATURES AND BENEFITS**

- Non-medicated supplement
- Good for Multi-aged flocks
- Can be mixed with farm grains to produce a layer ration for non-commercial laying hens

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<https://countryjunctionfeeds.com/>

39



40



41



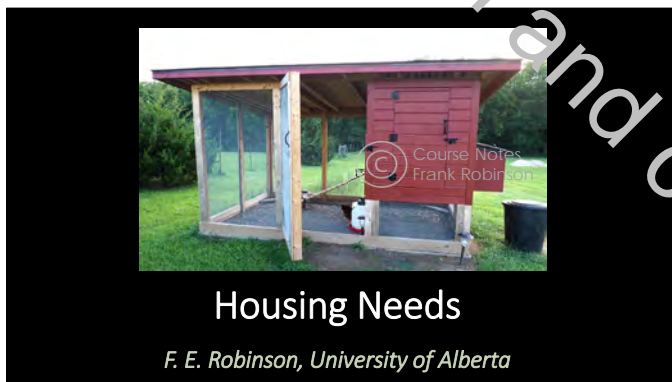
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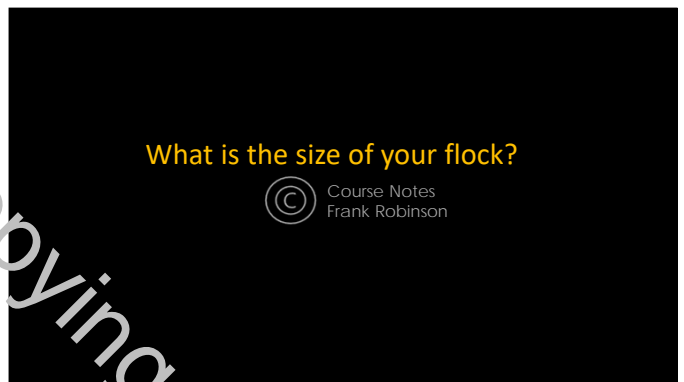
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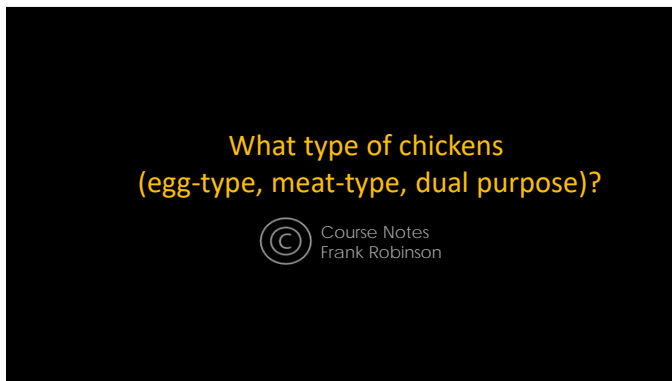
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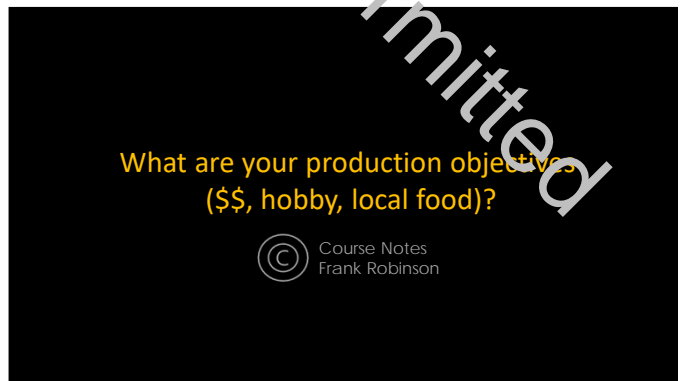
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46



47



48



### Minimum Quota Exemptions

Commodity	Course Notes Frank Robinson	2000
Broilers		2000
Table Egg Layers		300
Turkeys		300
Broiler Breeders (Hatching eggs)		0
Other Meat Species		No limit

Do you plan on seasonal or year round production?

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50

Do you plan on total confinement, enclosure or running free?

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What is your construction budget?

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Are there any land zoning issues to resolve?

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### Considerations for Small Flock Housing

- Structures
- Insulation
- Ventilation
- Light
- Heat
- Cleaning and sanitation
- Nests / Roosts / Dust Bathing
- Equipment

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54



55



56



57



58



59



60

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62



63



64

**Minimum Space Requirements**

Type of bird	Inside building (ft <sup>2</sup> per bird)	Outside enclosures (ft <sup>2</sup> per bird)
Bantam Chickens	1	4
Small Breed Chickens	1.5	8
Large Breed Chickens	2.5	12

Remember to subtract space used by feeders and waterers

65



66






73




74

### Principles of Ventilation

Hot air rises  
*(think hot air balloon)*



Hot air carries more moisture  
*(think clothes dryer)*



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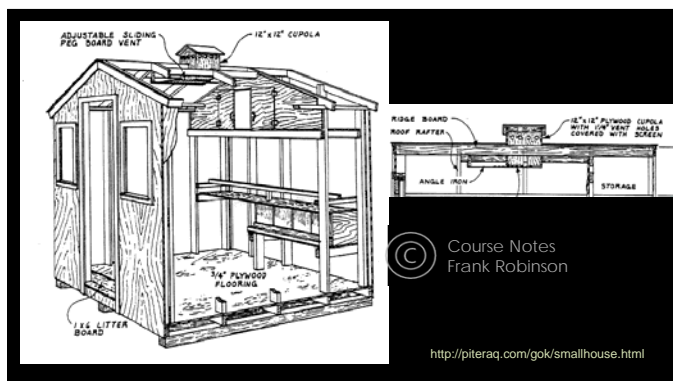
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### Principles of Ventilation

- For small flocks
  - moisture and heat removal are biggest concerns
  - electric fans are overkill
  - use natural principles (above)

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77

### Lighting Sources for Layers

- Incandescent bulbs
  - Advantages
    - Cheap
    - Good red spectrum
    - Excellent light distribution
    - Fast on
    - Work well in cold weather
  - Disadvantages
    - Burn out quickly
    - More than 90% of energy used goes to heat not light
    - Do not comply with new energy standards



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### Lighting Sources for Layers

- **Linear fluorescent lights (LFL)**
  - Similar to CFL
  - Advantages
    - Casts a broad even light
  - Disadvantages
    - Expensive
    - Prone to breakage




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79

### Lighting Sources for Layers

- **Light Emitting Diode (LED)**
  - The new standard for poultry lighting
  - Advantages
    - Full spectrum of light
    - Very energy efficient
    - Long lifespan
    - Easy to dim and turn off and on easily
  - Disadvantages
    - Expensive
    - Variable quality (and price)
    - Lights dim with age



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Sloped top to keep hens off

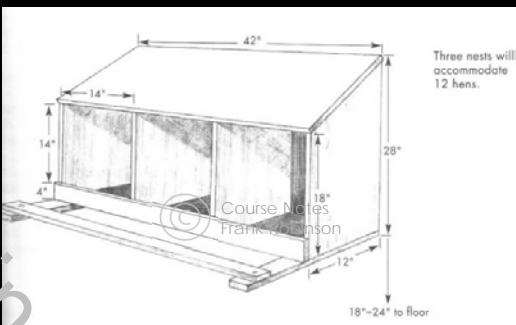
Nest litter guard

Walk way

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http://www.maryjanestarm.org/snitz/topic.asp?TOPIC\_ID=49035

81



42"

28"

18"

18"-24" to floor

14"

14"

12"

Three nests will accommodate 12 hens.

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http://www.chickencrossing.org/forum/viewtopic.php?id=2985

82



**Peavey** Mart

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<https://www.peaveymart.com/>

83

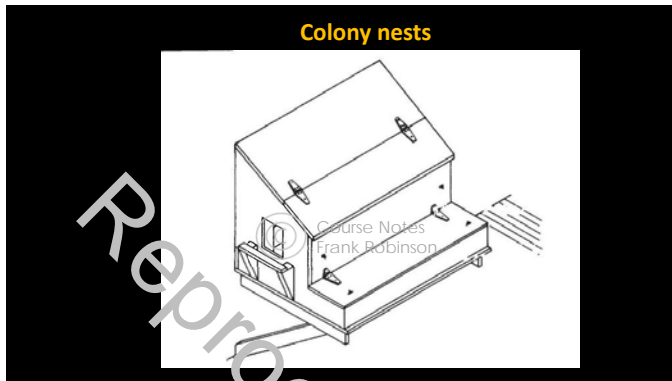


Sloped top and egg collection trough

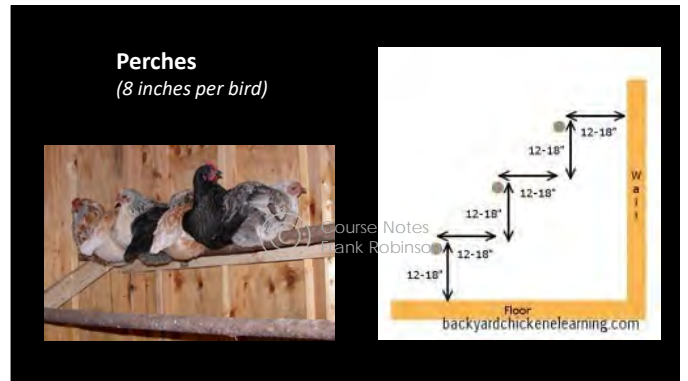
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https://www.strombergschickens.com/product/10-Hole-Roll-Out-Big-Bird-Nest/Large-Bird-Roll-Out-Nest-Boxes

84



85



86



87



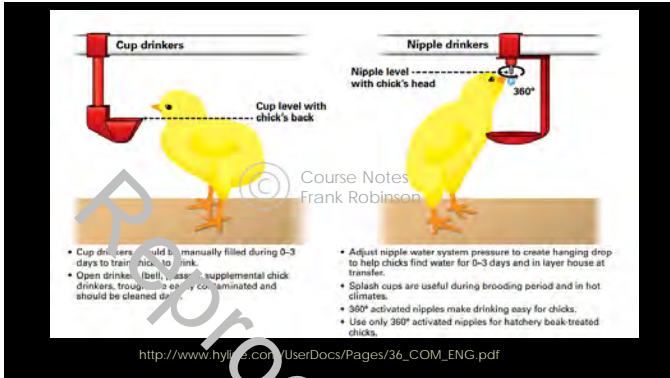
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89



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91



92



93



94