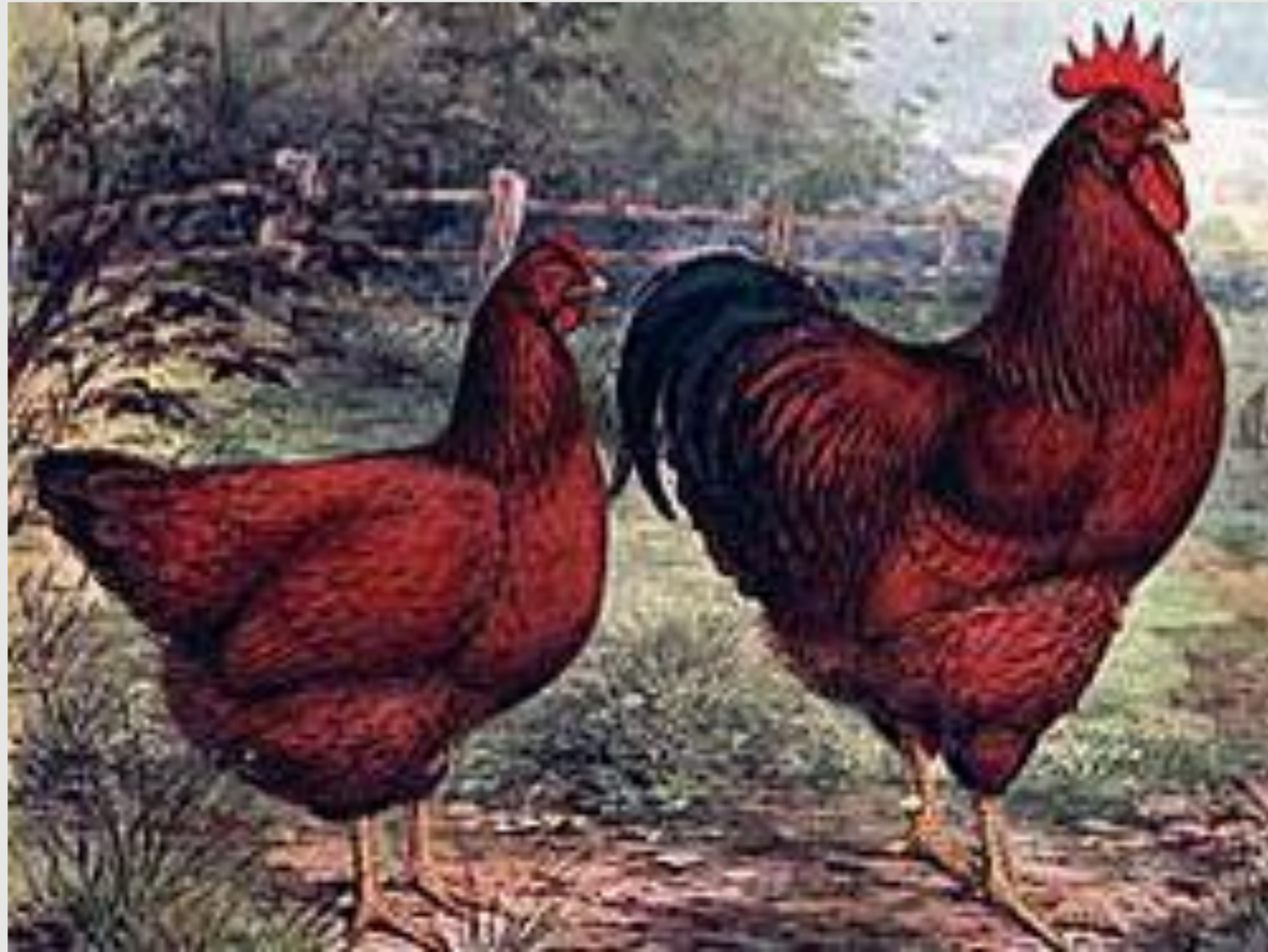


Raising poultry in Paradise

An overview of keeping chickens in the backyard



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Livestock Industries in Hawaii



Dairy (\$9.7 M)

\$47 Million*
Farm Gate Value



Pork (\$3.7 M)

Generating
\$141 Million

in Hawaii's Economy



Poultry (\$7.4 M)



Beef (\$26.2 M)

*HASS, 2007

Survey of Confined Operations 1999 to 2008

• 1999		2008	
• Broiler		• 0	↓100%
5		• 2	↓80%
• Dairy	10	• 5	↓55%
• Layer	11	• 21 ('04)	↓30%
• Swine	30	• 9	↓18%
• Processors	11		
• Beef Cattle	82,000 ('04)	82,700 ('08)	

Tasty, healthy Food

- Freshness is fundamental
- Eggs, nature's perfect food?
- Your food, your responsibility
- Less food miles



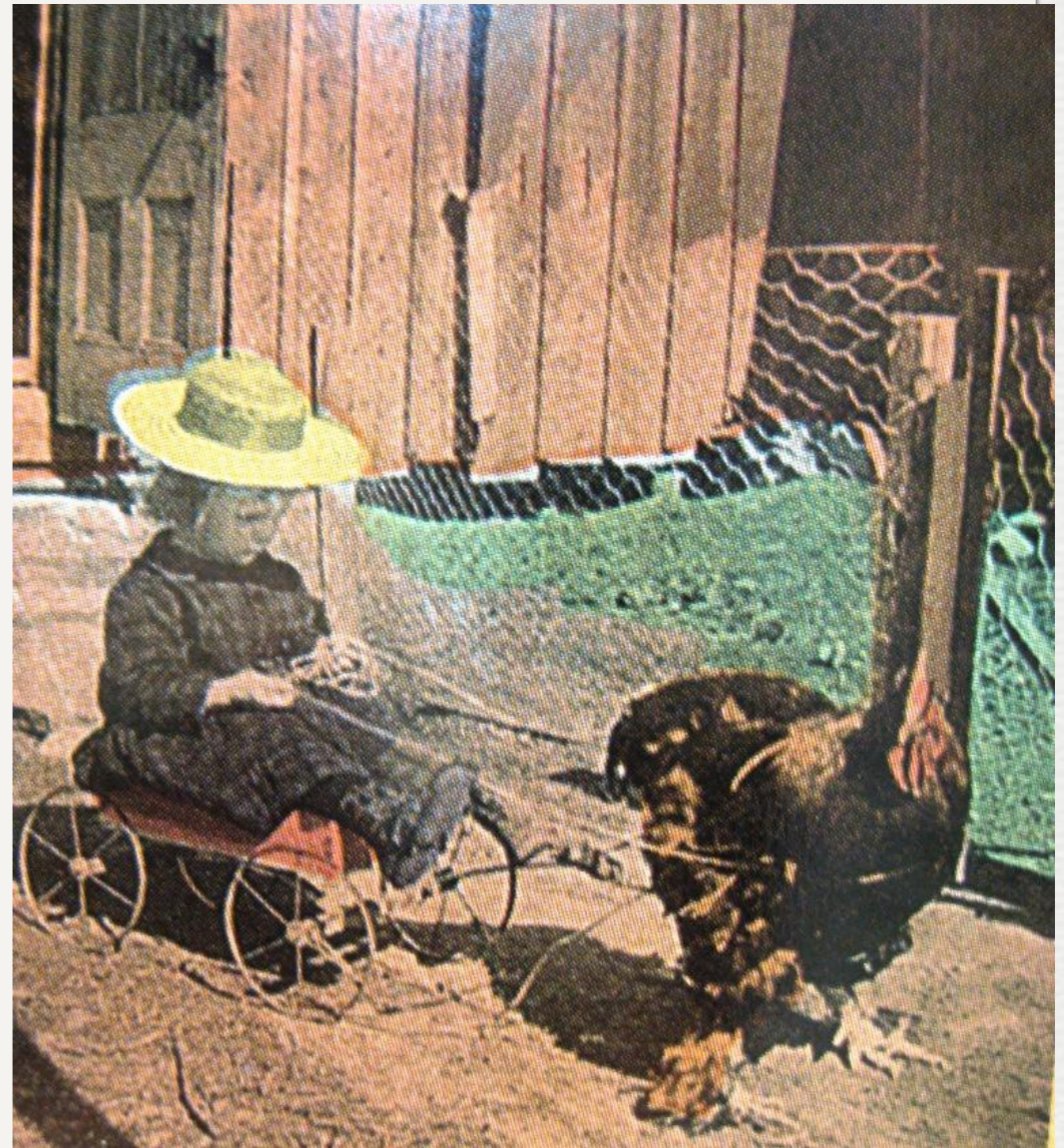
easy, low cost protein



- Little space required
- Low start-up and maintenance costs
- Not a huge time commitment
- Share the wealth

it's fun!

- Kids love to help and learn about food, responsibility
- Ecology in action
- Sense of self-reliance



Small Scale Confinement

- Pros

- Less labor
- Small production area
- Start-up costs lower ?

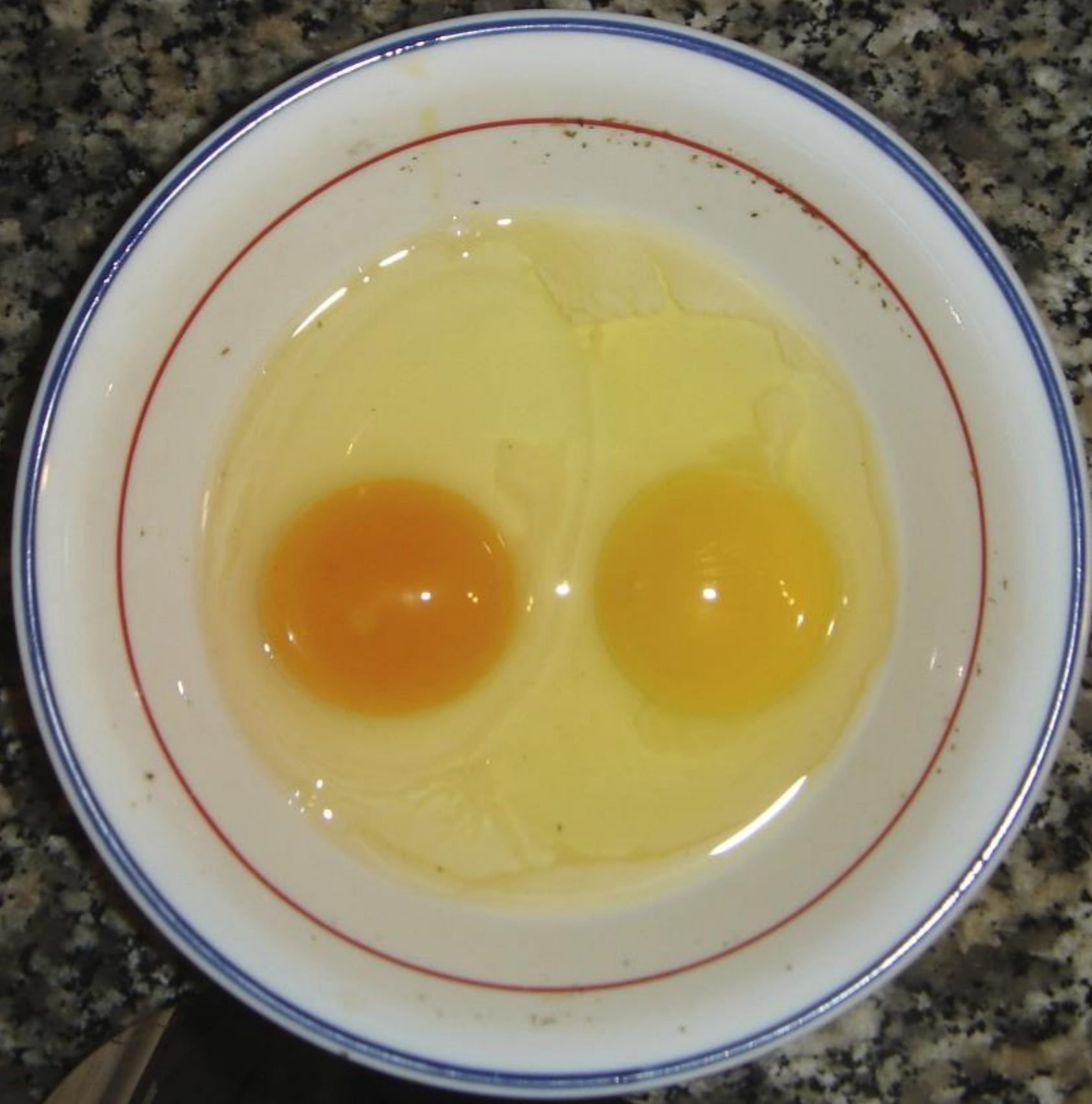
- Cons

- Manure build-up, odors
- Flies, other vectors



Pastured System

- Cons
 - More labor
 - Require “larger” area
 - Environment/Forage considerations
- Pros
 - No manure build-up. Direct nutrient application, stimulate nutrient cycling
 - Enhance natural behaviors
 - Supplemental feed through forage and insect ‘grazing’



first, the chicken

Some History

- Descended from Red Jungle Fowl native to Southeast Asia domesticated ~10,000 years ago
- Depicted on Mediterranean pottery by 7th cent. BCE
- Brought to Hawaii by ancient Polynesians along with pigs and dogs ~750 CE
- First documented “sale” of chickens in Hawaii was to Captain Cook at Waimea on Kauai in 1778

Names of the Chicken



Cockerel



Rooster



Chick



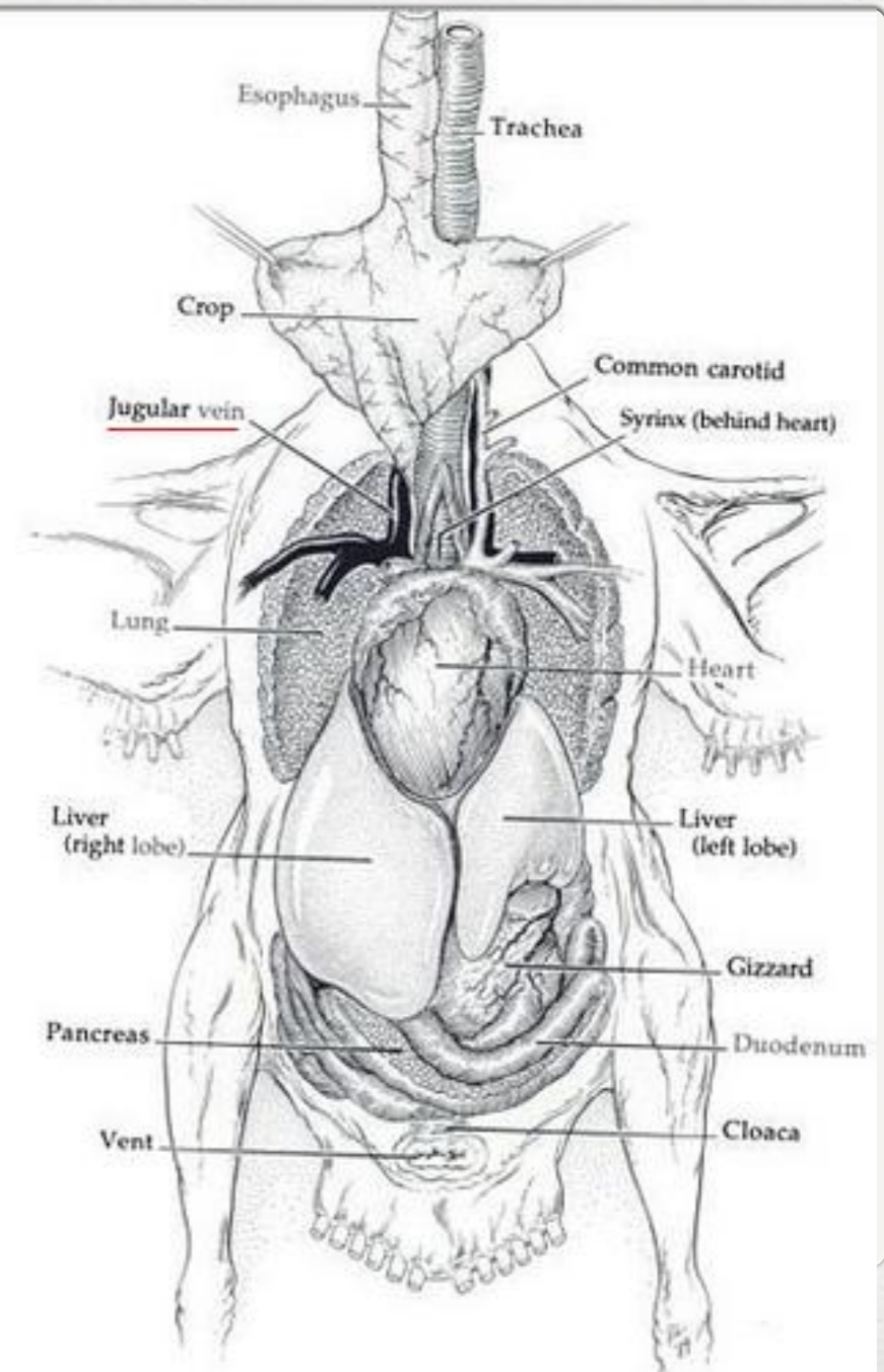
Pullet



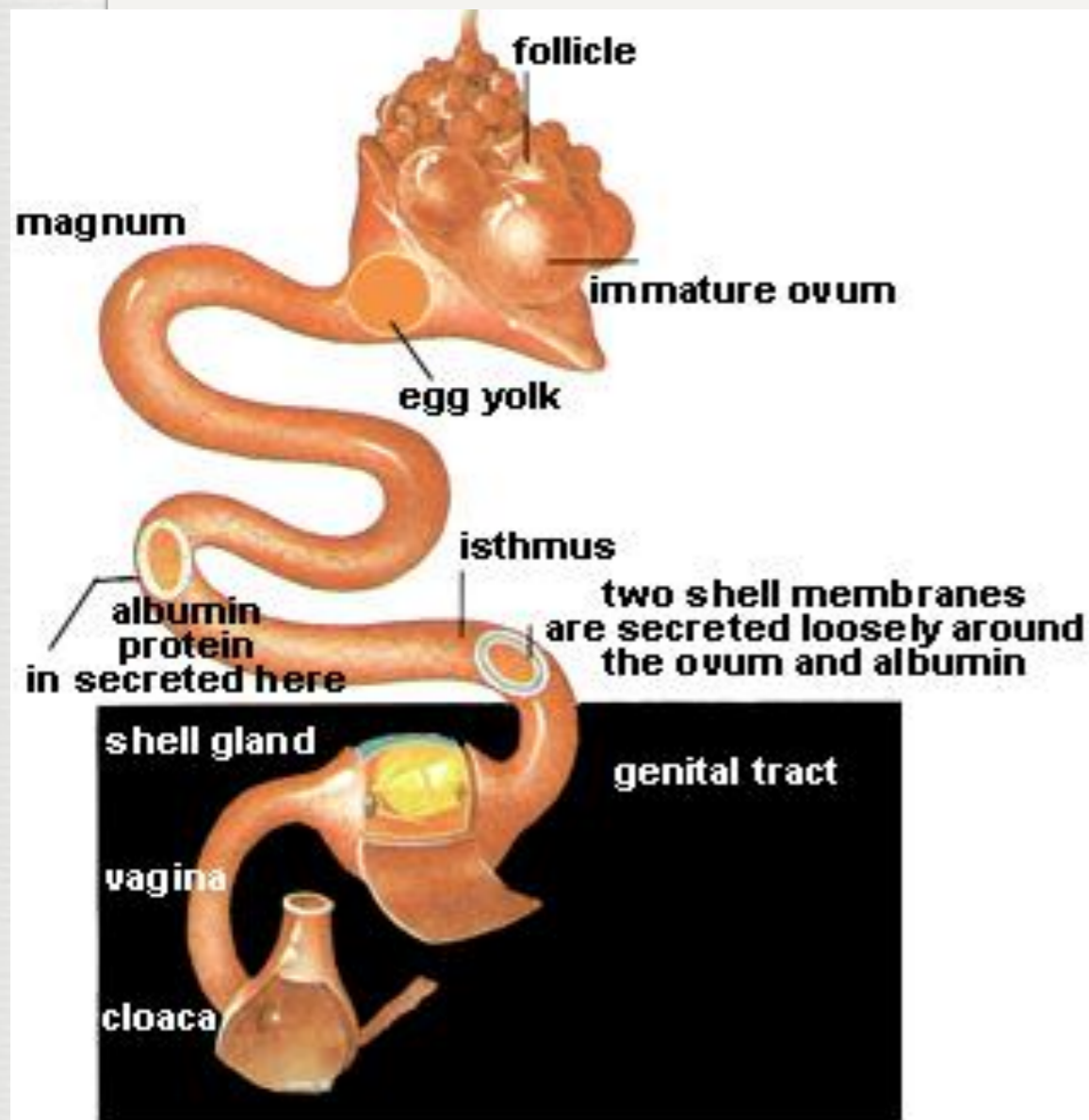
Hen

physiology

- Chickens' vision and hearing are akin to humans
- Poor sense of smell
- No teeth, use crop store and gizzard to “chew” food
- All chickens have combs, and all but Silkie's have wattles



Physiology



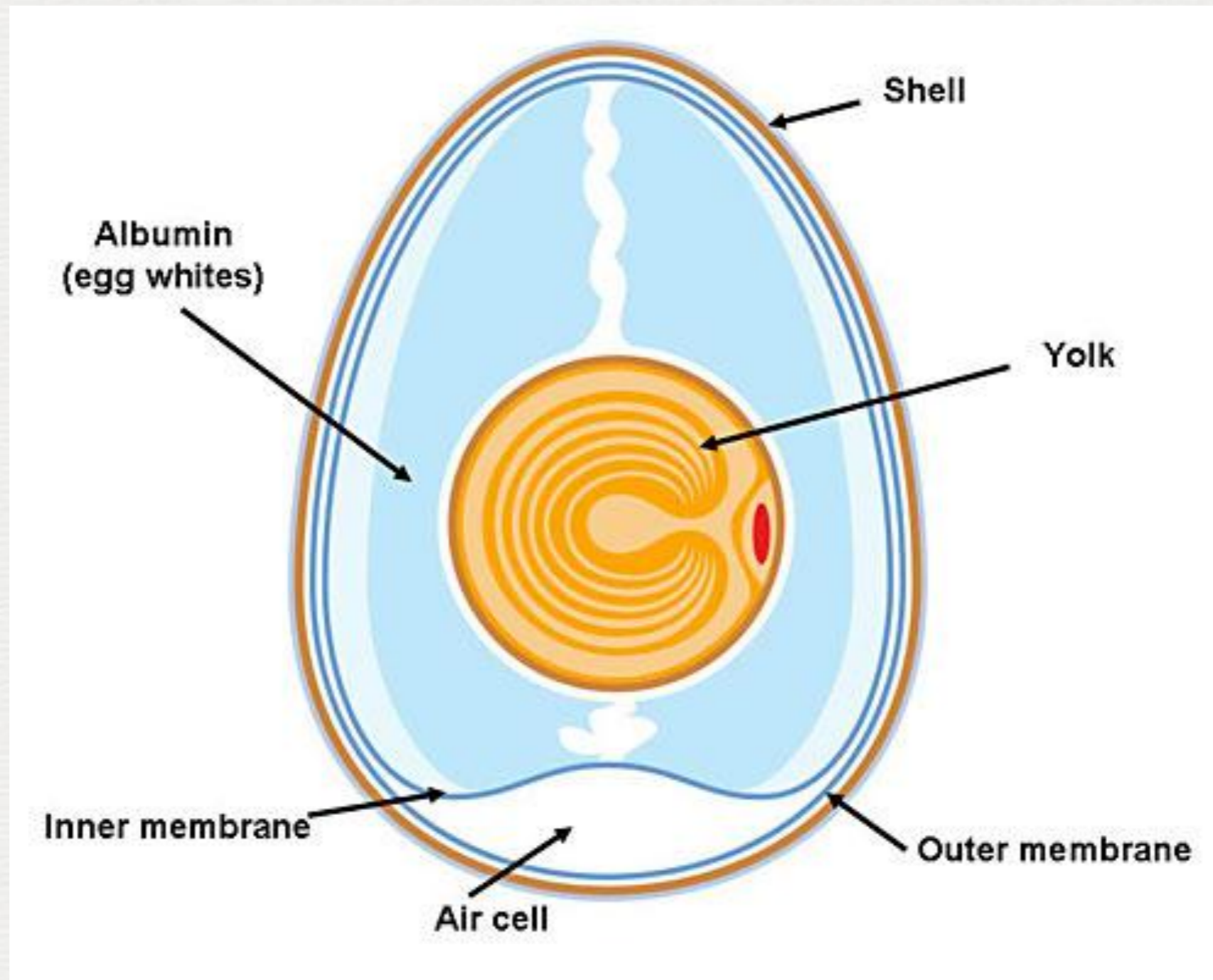
- Sexes differentiate around 3 and 8 weeks of age
- Pullets reach sexual maturity between 16 and 24 weeks
- Usually only 1 ovary matures which houses a clump of immature yokes
- Eggs are generally laid in the morning

Behavior

- Pecking Order: chicken hierarchy, develops by 5-7 weeks old in new chicks
- Change = Stress, Stress = Less Production
- Provide enough space and feed to avoid cannibalism
- Dust bathing
- Extremely intelligent with excellent memory



then, the egg



Egg Characteristics

- Contains all 22 essential amino acids, lacks only Vitamin C
- Second only to mother's milk in protein quality; FAO ranks eggs above dairy, fish, beef, and soybeans
- Most eggs weigh around 2 oz.; 10% is shell; 60% is white; 30% is yolk
- Egg shells can be green, brown, white, or speckled - color has no effect on nutritional quality

Egg characteristics

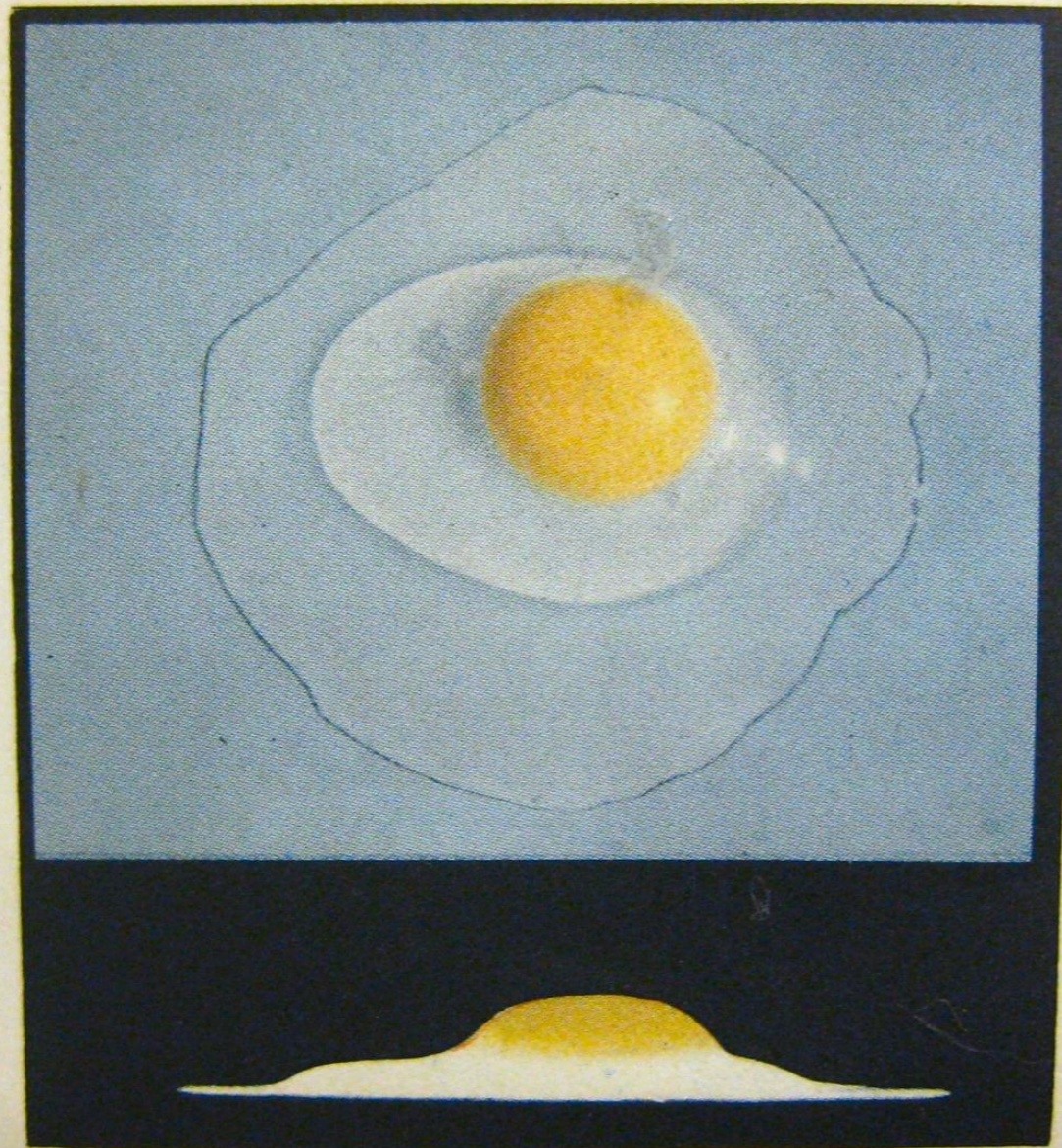
- Up to 10 times higher Omega-3 fatty acids from pastured hens - higher levels reduce risk for a suite of diseases
- 60% more vitamin B12; 50% more folic acid
- 34% less cholesterol in pasture based eggs
- Effects of fats and cholesterol dependent on who is eating them

egg quality

- Eggs are clean when laid, clean nest box = clean eggs
- The cuticle or “bloom” is removed with mechanical washing and may shorten shelf life
- Albumen has major influence on internal quality
- As the hen ages, albumen quality decreases
- Blood spots in eggs are normal and edible

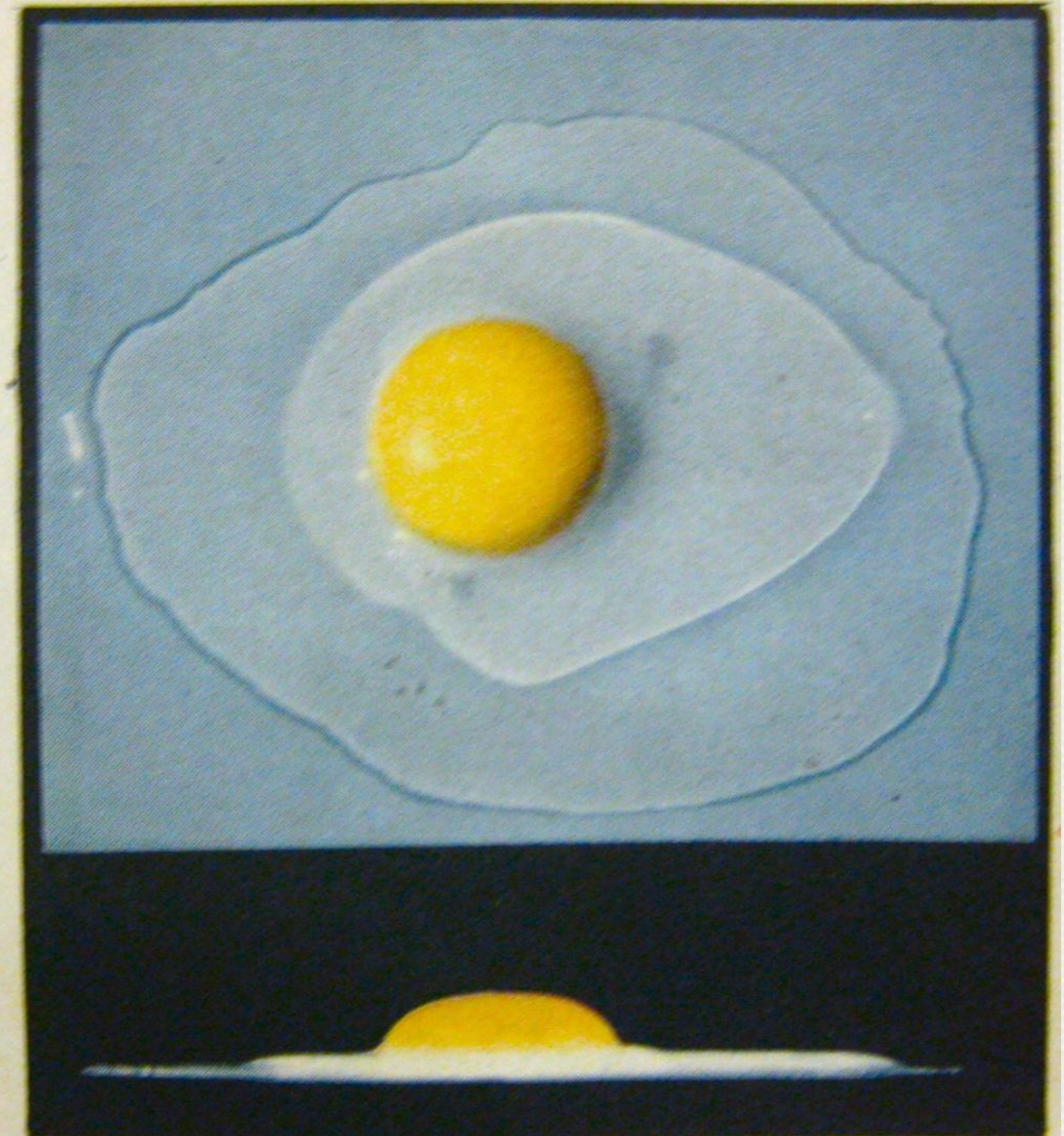
egg quality

AA Quality



Egg covers small area; much thick white surrounds yolk, has small amount of thin white; yolk round and upstanding.

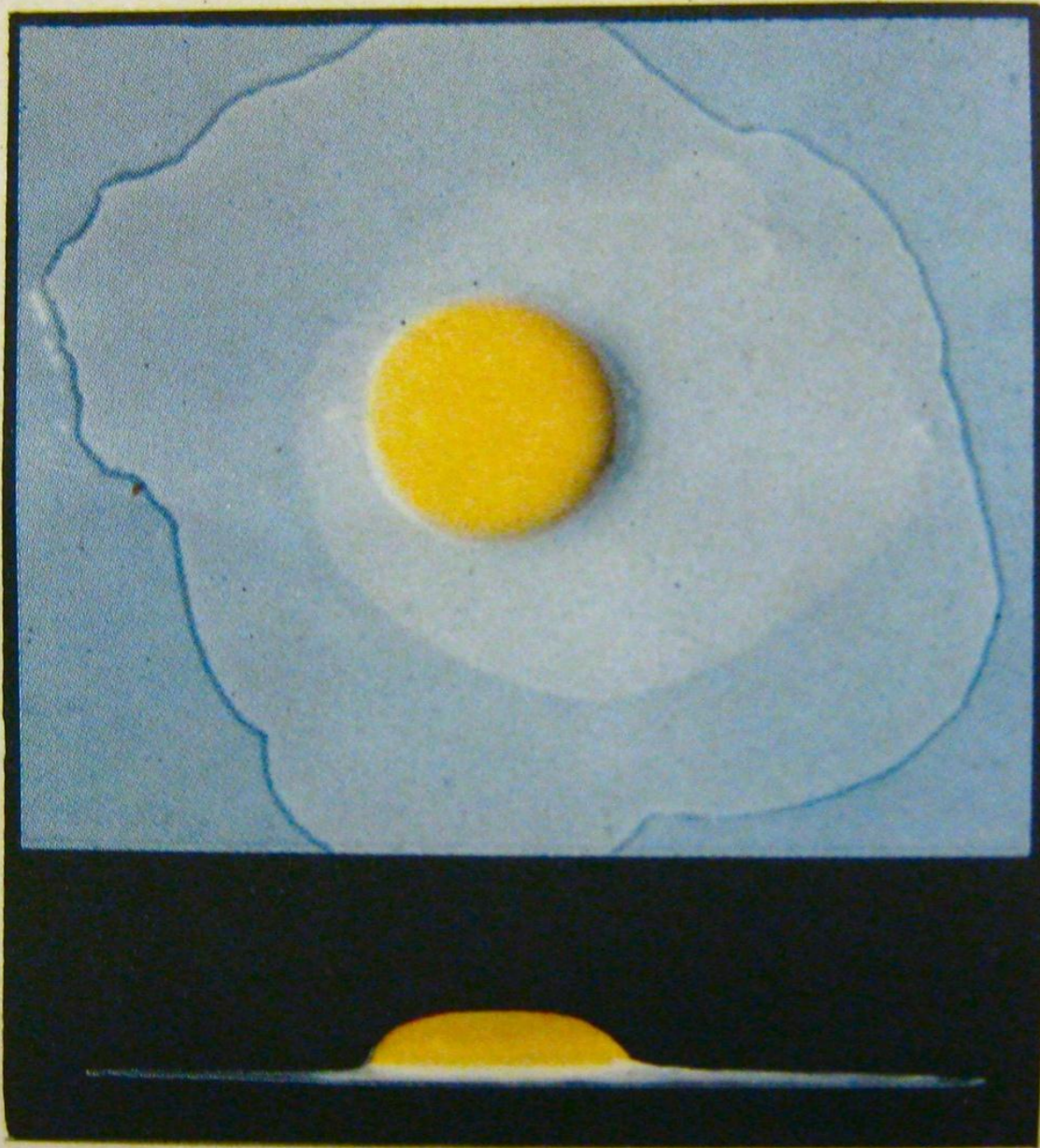
A Quality



Egg covers moderate area; has considerable thick white; medium amount of thin white; yolk round and upstanding.

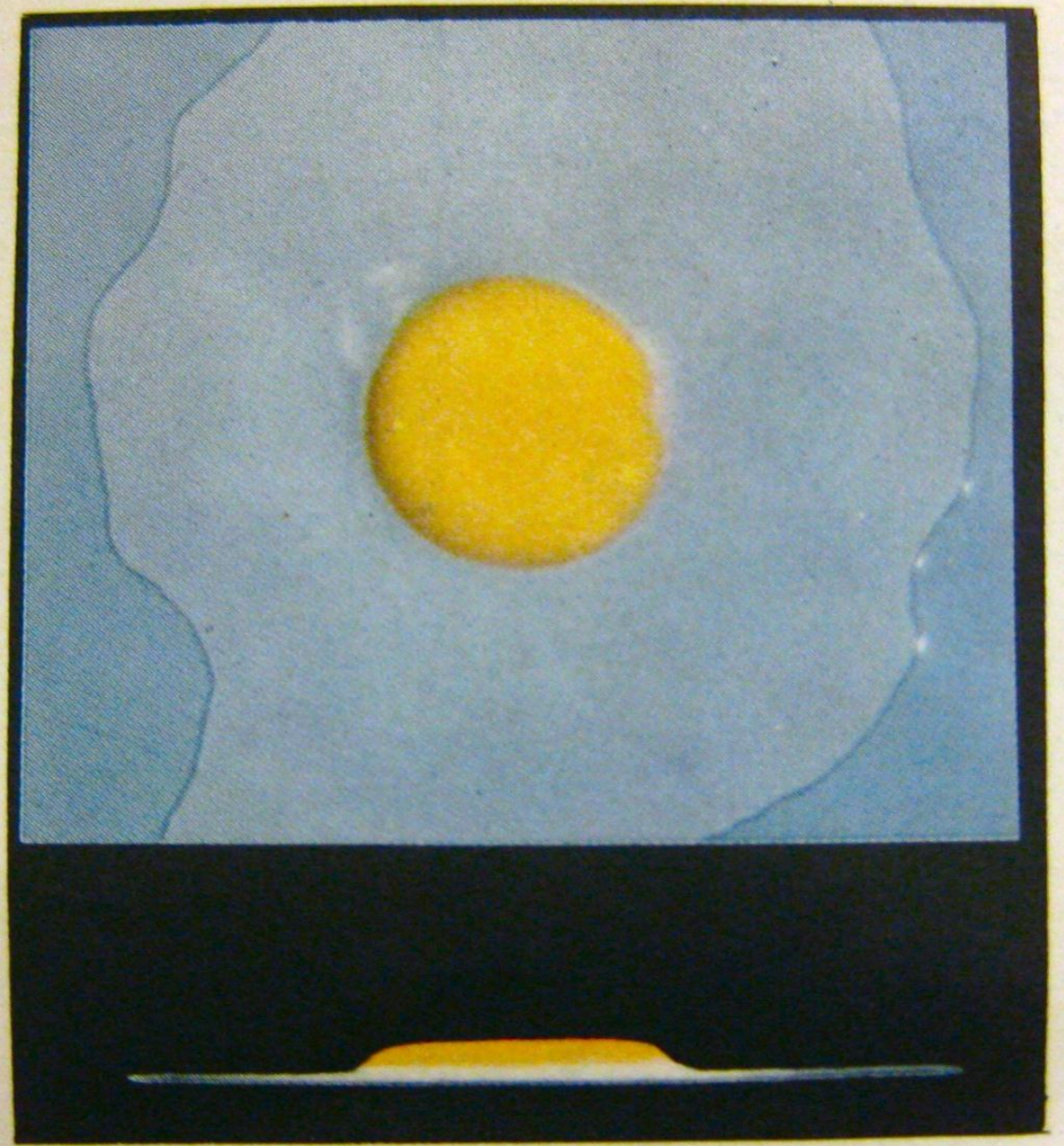
egg quality

B Quality



Egg covers wide area; has small amount of thick white; much thin white; yolk somewhat flattened and enlarged.

C Quality



Egg covers very wide area; has no thick white; large amount of thin white thinly spread; yolk very flat and enlarged.

breeds



Layers

- Leghorn
- Ameraucana
- Araucana
- Andalusian



Meat

- Cornish cross
- Wyandotte
- Cochin
- Shamo

breeds



Rhode Is. Red



Plymouth Rock



Australorp



Araucana



New Hampshire

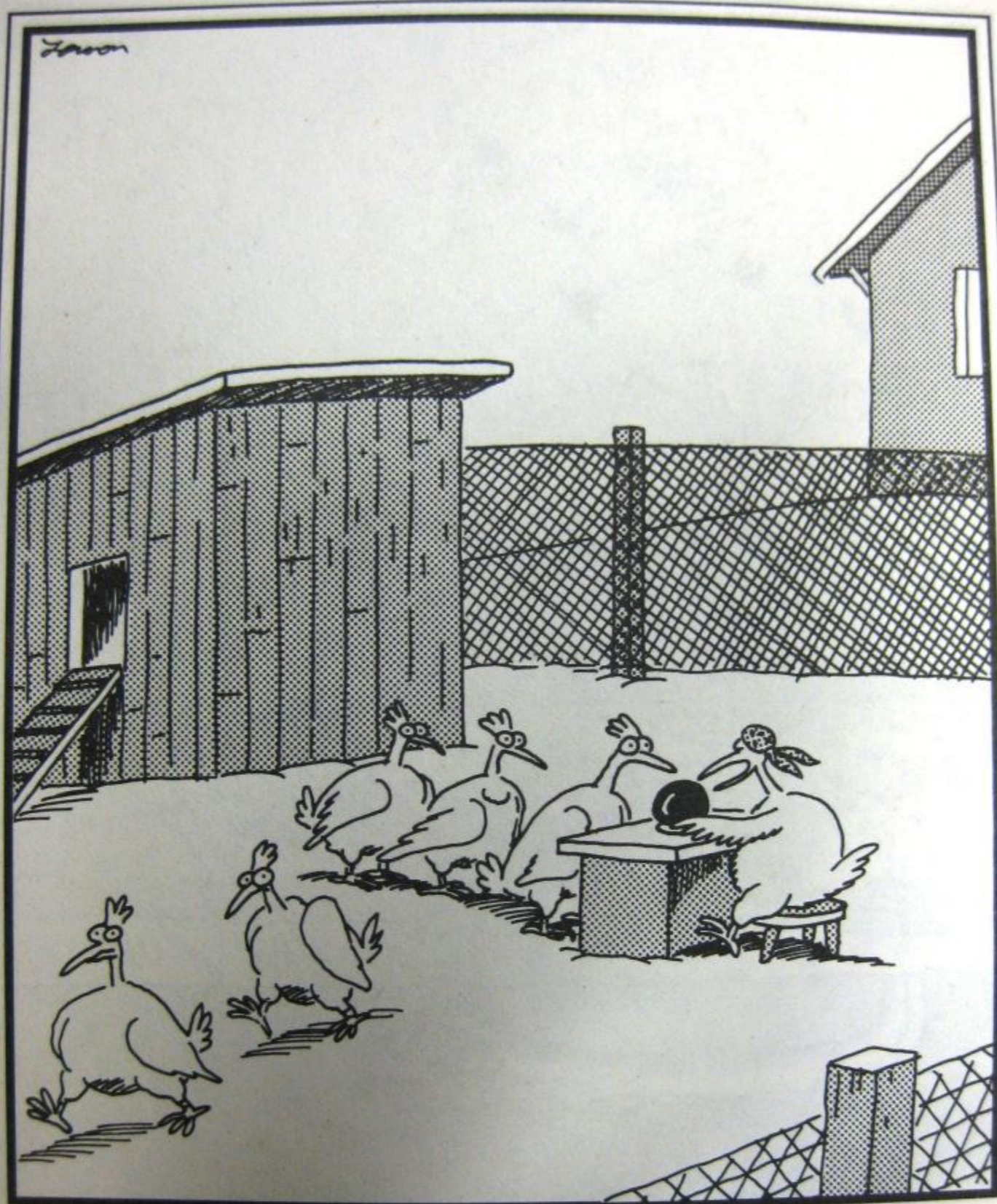


Buff Orpington

Meat birds

- Called broilers & fryers
- Mature in 6-12 weeks
- Pasture raised birds take longer to mature
- Flavor and health benefits similar to pastured eggs
- Simple to process, no specialized equipment





“Whoa! Another bad one! ... I see your severed head lying quietly in the red-stained dirt, a surprised expression still frozen in your lifeless eyes. ... Next.”

processing

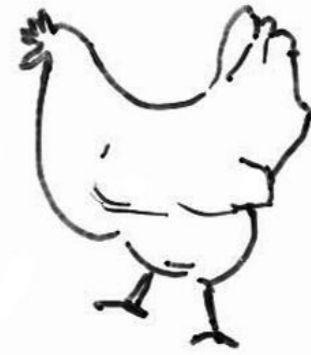
- 6-8 hour fasting period
- Immobilize - cone or line
- Cut jugular (not windpipe) and drain blood completely
- Immerse in 125F water for 30 to 75 seconds
- Pick feathers immediately using rubbing action



processing

- Remove head, neck, shanks, and oil gland
- Eviscerate
- Rinse clean thoroughly
- Submerge in ice water to 40F before packing (~2hrs)
- Drain completely before bagging and storing

Basic Nutrition



- Water
- Energy
- Protein (Lysine, Methionine)
- Calcium, Phosphorus

Daily Nutrient Requirements of Chickens*

Type	CP (g)	Energy (kcal/kg)	Lysine (g)	Methion. (g)	Calcium (g)	Phosph. (g)
Layer Chicks 0 wks - 1st egg	1.7 - 16.5	2800 - 2850	0.05 - 0.76	0.02 - 0.33	0.18 - 3.6	0.04 - 0.28
Broilers 0 - 9 wks	4.4 - 40.5	3200	0.2 - 1.9	0.1 - 0.72	0.19 - 1.8	0.09 - 0.68
Laying Hens	16.5	2900	0.76	0.33	3.6	0.28

*From National Research Council, 1994

Temperate Feedstuffs

- Energy Grains (corn, sorghum, other grains)
- Protein grains (soybeans)
- Forages (alfalfa)

Tropical Feedstuffs

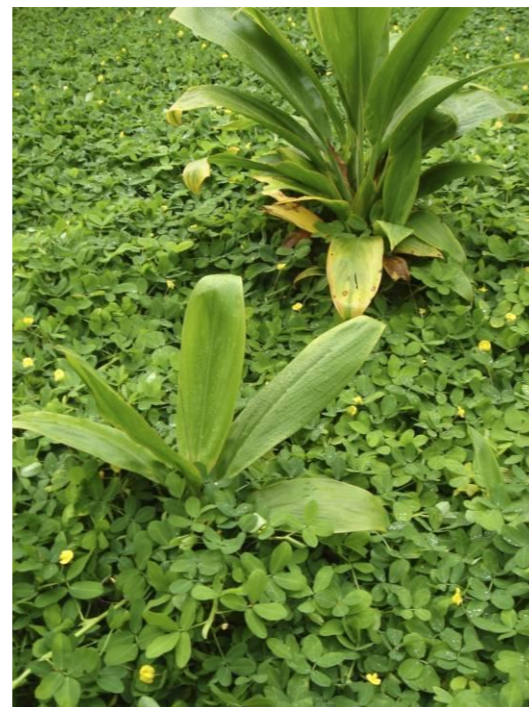
- Energy (cassava, taro, breadfruit, sweet potato, yam, coconut, banana, macadamia)
- Protein (pigeon peas)
- Forages (clovers, perennial peanut, leafy perennials)

Other Potential Feedstuffs

- Food wastes (bakery products, wheat mill run)
- Protein (meat and bone meal)
- Other crop industries (vegetable, papaya)

Forage Production and Alternative Feeds

- Alternative Feeds
 - Perennial peanut
 - Stoloniferous grasses, legumes
 - Cull fruits and vegetables
 - Leafy perennials
 - Other: pigeon peas, sorghum



Estimating Forage Production



Composition of Feedstuffs

Type	CP (%)	Energy (kcal/kg)	Lysine (%)	Methion. (%)	Calcium (%)	Phosph. (%)
Laying Hen Reqs.	15	2900	0.7	0.3	3.3	0.25
Dent Corn grain	9.6	3377	0.26	0.18	0.04	0.3
Bakery waste	7.7	4193	??	??	0.16	0.35
Cowpea	26.7	??	??	??	0.1	0.5
Soybean meal	44	2230	2.69	0.62	0.29	0.65

*From National Research Council, 1994

Optimum Levels in Rations of Selected Ingredients*

Feedstuff	Optimum Level (%)
Citrus pulp	5 - 10
Coconut meal/cake	5 - 15
Coffee grounds	3-5
Leucaena leaf	2 - 5
Palm kernel meal	10 - 40
Palm oil	2 - 8
Sugar cane molasses	10 - 30

*Adapted from Hutagalung, 1981 in Sonaiya and Swan, 2004

“All-Hawaiian Emergency Ration*”

Feedstuff	Ration 1 (%)	Ration 2 (%)
Fish meal	15	-
Meat scraps	-	17
Sorghum (milo)	55	-
Corn	-	54
Pigeonpea meal	7	-
Soybean oil meal	-	3
Peanut oil meal	-	3
Kiawe bean meal	15	-
Pineapple bran (fine)	-	15
Koa haole seed meal	5	5
Salt	1	1
Coral sand	2	2
Total	100	100

*Adapted from Bice, 1947 - “The birds on the above ration averaged 55% production over the duration of the experiment which lasted for a period of 6 months” (pg 17).

Rotational Grazing Management

- Provides fresh green forage, replacing a portion of imported feed grains.
- Forage cover crop reduces erosion, enhance water percolation and water holding capacity
- Grazing rotation increases plant recovery periods, improving plant vigor.
- Improves plant communities and reduces weed competition.

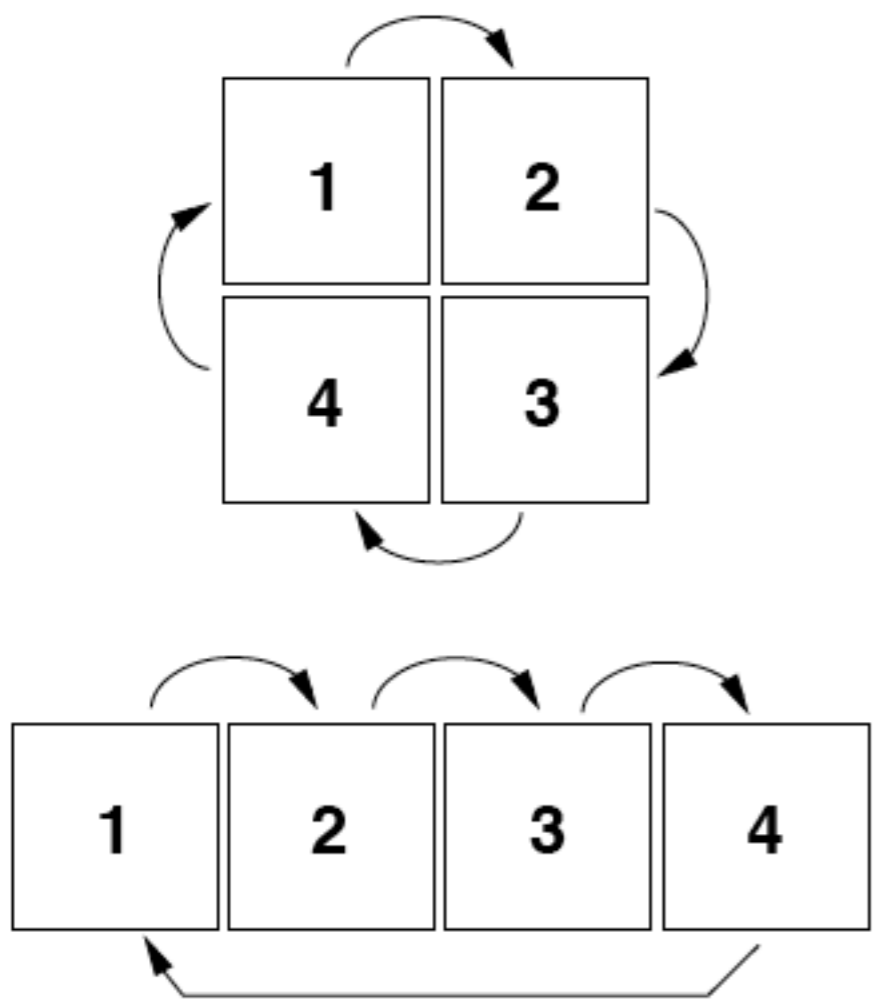
Rotational Grazing Management

- Improves nutrient cycle of the area, improves water cycling and build soil organic matter for improved forage plant growth.
- Reduce environmental concerns of manure build-up, odors, nuisance vectors.
- Pathogens reduced through solar disinfection.
- Animals become docile through frequent interaction with people.
- Animals are controlled in a well managed system

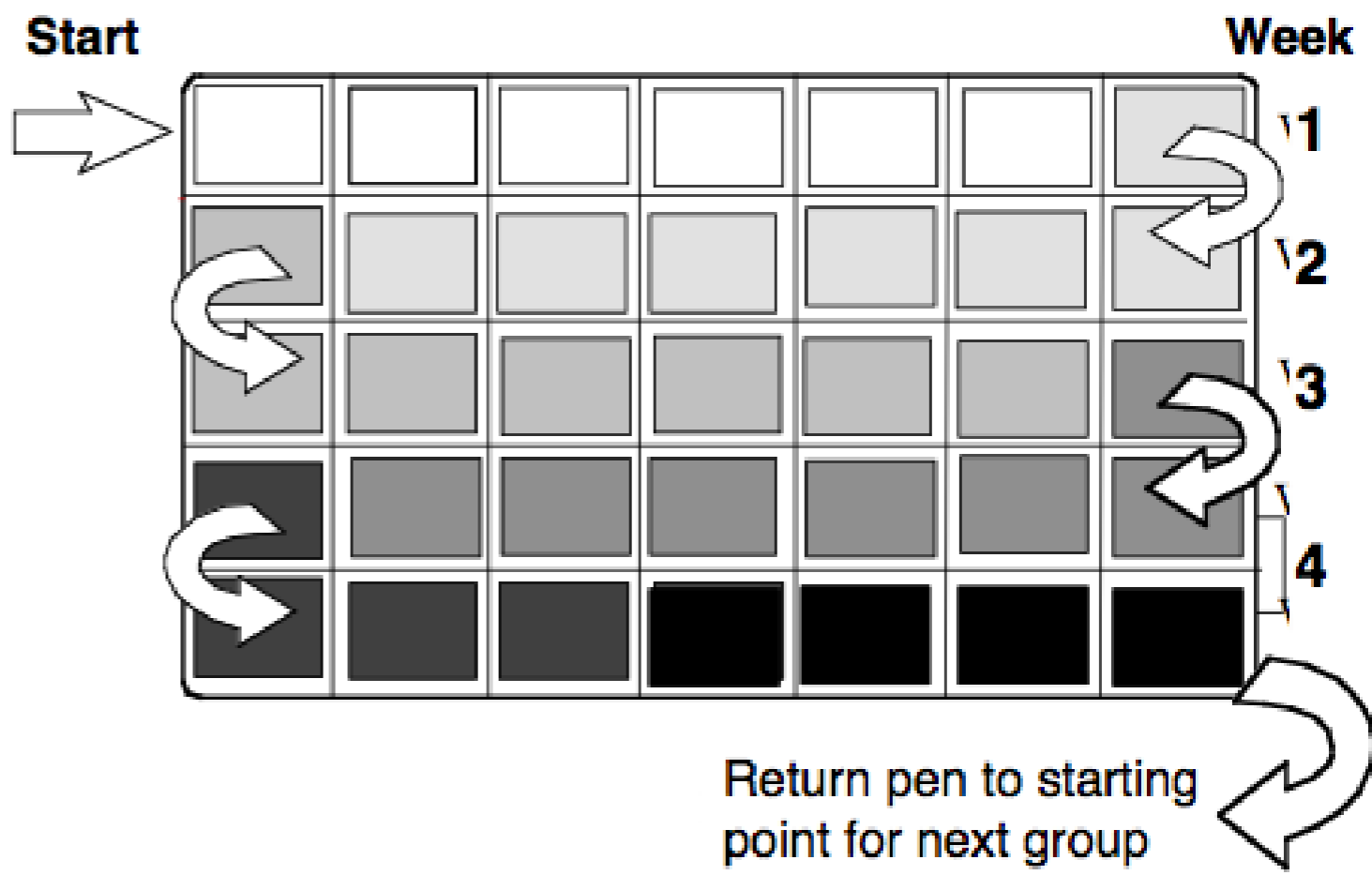
Examples of Grazing Rotations



4-cycle rotation



28-cycle rotation





0-d rest

5-d rest

12-d rest











From chick to molt

Overview of laying systems



picking up chicks

- Cardboard box with bedding and space at 0-4 weeks: 0.5 ft²/bird
- Food, Water, Heat, Protection
- Need to keep day old chicks warm: 90-95F
- Avoid hard surfaces



in transition



- Medicated or Non-medicated feed?
- 4-8 weeks: 1ft²/bird
- ~6 weeks switch to lower %CP ration
- 8-12 weeks move to pasture & lay ration

she's got eggs

- First, small eggs laid between 16-24 weeks of age
- Will lay for about 12-18 months before “molting”
- Rate of lay will be about 65-85% of lay before molt
- Purchase or hatch replacements 4-6 months before molt



in the end...



One last test...

