



20-Egg Layers Model

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Introduction

Producing fresh local eggs for your family and your neighbors by raising poultry in your backyard can be a rewarding experience. Taking good care of animals, however, requires dedication to their well being, so before starting to raise layers, you should consider the following:

- ❑ Make sure you have the time, about 15 minutes per day, for about two years.
- ❑ Check with your village mayor or homeowner association to find out about restrictions in raising poultry in your area.
- ❑ Find a reliable source of day-old chicks on Guam or contact hatcheries in Hawai'i or on the US mainland.
- ❑ If you plan to import chicks, obtain an import permit from the Guam Department of Agriculture.
- ❑ Find a reliable source of high quality commercial poultry feed. Could be imported or locally-made, but needs to have the proper nutrient quality for the hen's life stage.
- ❑ Use social media to advertise to friends and family to establish your egg market and eventually a market for your spent hens.
- ❑ Provide the most suitable and affordable shelter to protect the birds from sun, rain, drafts, and predators. This may be store-bought or self-built, or a blend of the two.
- ❑ Have a contingency plan to secure and protect your birds during typhoon season.

General Care for Chickens

Chickens need to be protected from inclement weather, predators, and moldy feed. Always keep feed in a dry place and avoid storing feed for more than 4 weeks. Layer rations are computer-formulated to provide the proper amount of calories, proteins, calcium, and other

vital nutrients. Avoid diluting commercial feed with other feeds or ingredients as this may cause imbalances in nutrient requirements. Overall, and always, keep a hygienic, safe environment for hens and provide access to quality feed and clean water.

About Eggs

Eggshell pigmentation is a breed trait and can be generally predicted by checking the color of the earlobe (white for white shell, or red or brown for brown shell). Shell color has no effect on egg quality and is a matter of consumer preference. Just before laying, eggs are naturally lubricated with a waxy cuticle, which evaporates in a few



Fig. 1. Egg collection basket.

Production Assumptions	Cost
Labor Cost	\$7.00
Number of Birds in Unit	20
Chick Cost	\$3.75
Percent of Birds Lost Before Slaughter	5.0%
Size of Bag of Feed	50
Feed Cost/50 lb bag	\$24.50
Cost for One Nest (if purchased)	\$7.00

Sales Assumptions	Cost
Sales Price/doz eggs (xl)	\$5.50
Sales Price/doz eggs (lg)	\$5.00
Sales Price/doz eggs (md)	\$4.50
Sales Price of spent hens	\$10.00
Sales price manure	\$8.50

Description	No.	Unit	Cost
Costs			
Chick Cost	20	ea.	\$75
Number of Chicks/Chickens		no.	
Mortality		%	
Body Weight/bird		lbs./wk.	
Floor Density		sq.ft./bird	
Feeder Density		feeder/bird	
Water Fountain Density		gal./bird	
Days in Stage		days	
Labor Needs/day		min/day	
Labor Needs/week		hrs.	
Labor Needs/entire stage		hrs.	
Labor Cost/stage & Total		\$	\$698
Feed Type			
Protein		%	
Calcium		%	
Feed Form			
Feed Intake		lbs./day/bird	
Feed Consumed		lbs.	
Feed Cost		\$	\$902
Feed Conversion		lbs./doz.	
Egg Production		% hen/day	
Total Eggs		ea.	
Total Dozens		dz.	
First Stage			
Extra large			
Large	20%		
Medium	80%		
Second Stage			
Extra large	45%		
Large	45%		
Medium	10%		
Revenues			
Egg Revenue			
Spent Hens Sales	19	ea.	
Manure bags (through 63 weeks)	30	ea.	

Revenue	Brooding	Pullets	First Stg. Layers 22 weeks long	Second Stg. Layers 23 weeks long
	20	20	20	19
	0%	0%	0%	5%
	1.6 lbs. @ 8 wks	3 lbs. @ 16 wks	4.00 lbs. @ 40 wks	4.5 lbs. @ 63 wks
	3	3	3	3
	1 feeder/10 birds	1 feeder/5 birds	1 feeder/5 birds	1 feeder/5 birds
	1 gal/20 birds	2 gal/20 birds	3 gal/20 birds	3 gal/20 birds
	56	70	154	161
	10	10	15	15
	1.17	1.17	1.75	1.75
	9.33	11.67	38.50	40.25
	\$65	\$82	\$270	\$282
	Chick Starter	Pullet Grower	Layer	Layer
	21	17	20	20
	0.9	1	4-5	4-5
	Pellets	Pellets	Pellets	Pellets
	1 lb/day/20 birds	3 lbs/day/20 birds	5 lbs/day/20 birds	5 lbs/day/19 birds
	56	210	770	805
	\$27	\$103	\$377	\$394
			4.84	3.95
			62%	80%
			1,909.6	2,447.2
			159.1	203.9
	\$159		31.8	
	\$573		127.3	
	\$505			91.8
	\$459			91.8
	\$92			20.4
	\$1,787			
	\$190			\$190
	\$255			

The Kit	No.	Unit	Cost	Total Cost	Replace Every X Year
Housing	1	ea.	\$199	\$199	5
Roof	1	ea.	\$80	\$80	5
Tarp 1 (side)	1	ea.	\$34	\$34	5
Tarp 2 (back)	1	ea.	\$17	\$17	5
Subtotal Housing Costs				\$330.00	

Feeders	4	ea.	\$4	\$16	5
Water Fountains	3	ea.	\$5	\$15	5
Egg Nests	2	ea.	\$7	\$14	5
Floor/Egg Nest Bedding	1	ea.	\$48	\$48	2
Shredded Paper	126	ea.	\$0	\$0	2
Perch	1	ea.	\$0	\$0	2
Egg Cartons	363	ea.	\$0.74	\$269	3
Feed Bucket with Cover	1	ea.	\$4	\$4	5
Scoop	1	ea.	\$2	\$2	5
Egg Basket	1	ea.	\$12.75	\$13	5
Scouring Pad	1	ea.	\$2	\$2	2
Padlock	1	ea.	\$12	\$12	10
Storage/Transport Crate	2	ea.	\$8	\$16	5
Sponge	1	ea.	\$1	\$1	2
Subtotal All Other Supply Costs				\$411	

Total Start Up Fixed Costs	\$741
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Cost Analysis Per Cycle

Costs	Start-up	Cycle
Fixed		
Housing	\$330	\$110
All Other Supplies	\$411	\$214
Variable Costs		
Chicks		\$75
Labor		\$698
Feed		\$902
Total Cost	\$741	\$2,000

Revenues	Start-up	Cycle
Eggs		
Medium		\$665
Large		\$618
Extra Large		\$505
Spent hens		\$190
Manure		\$255
Total Revenues		\$2,232

Profits	Start-up	Cycle
Profits per cycle (this does not include labor wages that might be paid to entrepreneur)		\$233

Useable for Number of Cycles	Cost Per Cycle	Characteristics	Example or alternative	Used For
3	\$66.33	6ft. W x 10ft. L x 6ft. H	Dog Kennel/Canopy & Pipes	Shelter
3	\$26.67	6ft. x 10ft.	Canopy and pipes	Shade
3	\$11.33	12ft. X 16ft.	Tarp or bamboo shade	Side cover
3	\$5.67	10ft. X 10ft.	Tarp or bamboo shade	Back and front cover
\$110.00				

3	\$5.33	1' 9" L x 5" W	PVC Pipes/Bamboo/Container	Feeding
3	\$5.00	1 gal ea.	1 gal. Plastic Bootles/Pans	Drinking
3	\$4.67	1' 5" W x 1'10" L x 10"H	Laundry basket/Trashcan	Egg laying
1	\$48.00	125 lbs. bale of hay (straw)	Straw/Shredded paper/Grass	Egg nest and floor
1	\$0.00	25 lbs. of shredded paper	Office Paper or newspaper	Floor Bedding
1	\$0.00	8-10 ft long	Bamboo/Tangantangan	Sleeping and resting
2	\$134.33	One doz/carton	Old egg cartons/small basket	Egg storage
3	\$1.33	5-gallon bucket	Paint bucket	Feed storage
3	\$0.67	3 cups	Kitchen scoop	Serving feed
3	\$4.25	Capacity 30 eggs	Bamboo/Straw	Egg collection
1	\$2.00	Stainless steel	Metal sponge or coconut husk	Egg dry-cleaning
5	\$2.40	Key or combination padlock	Cable and combination	Securing chicken house
3	\$5.33	Polyethylene, stackable	Crate or Shopping Bag	Egg delivery
1	\$1.00	Cellulose or synthetic	Sponge or brush	Cleaning feeders and fountains
\$214				

Cycle Cost	\$324
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seconds afterwards. Eggshell is porous and can dry out, but the cuticle seals up the microscopic pores to reduce interior drying. Table eggs are infertile and are used for human consumption while fertilized eggs are from breeding stock and are destined for hatcheries. Egg is an excellent source of energy and loaded with nutrients such as proteins, omega-3 fatty acids, vitamins, and minerals.

Housing

No matter the raising style (free-range, floor, or cage), poultry must have housing that provides a secure and comfortable environment. On Guam and in Micronesia, canopies and pipes are commonly used for temporary shelter. Adding a chain link fence (with a smaller mesh) around your chickens, along with a floor that does not flood and stay damp, will provide your hens with an affordable environment for shade, and will protect your birds from predators such as cats, dogs, monitor lizards, and snakes. The model described here is a dog kennel (6 ft. wide x 10 ft. long x 6 ft. high) with a roof and additional canopy on the sides, back and front, to keep the premises dry during the rainy season (Figure 2).



Fig. 2. Chicken housing (6 ft. wide x 10 ft. long x 6 ft. high/ Assembled weight: 106 lbs.) with canopy on sides, roof and front, and galvanized chain link and security latch.



Fig. 3. Back cover of chicken housing with canopy to protect premises from rain.

The Kit

In addition to good quality housing for chickens, there are a number of other items that will be needed to create a suitable production environment. The numbers in parenthesis indicate the number of items of this type to be acquired.

- Shredded office paper for floor bedding/litter: The paper must be clean and dry. The ink must be non-toxic.
- Egg cartons: They can be purchased or recycled. Start collecting recycled egg cartons the day the day-old chicks arrive to give enough time to collect as many egg cartons as possible before the first egg is laid (about 18 weeks).
- Egg basket (1): Choose a plastic or bamboo basket to collect eggs daily. Add straw to the bottom of the basket to minimize egg rolling and cushion impact.
- Feed bucket(s) with cover (1): This is for feed storage and access near the poultry house. The bucket needs to be closed properly at all times and kept away from excessive moisture to avoid humidity build up inside the bucket. Humidity can influence mold growth and certain molds can make hens sick and they can die.

- Combination lock (1): To secure the premises. Make sure to share the combination with somebody else in case you are not around. A lock with a key will work as well.
- Scouring pad (1): A stainless steel scouring pad, without soap or water, is very handy especially if prefer dry-cleaned, instead of wet-cleaned eggs. Dry-cleaning preserves the egg cuticle that seals the pores of the eggshell while wet cleaning tends to remove the cuticle. Cuticle removal may accelerate gas exchange between air and egg interior, and increase air sac size, which may eventually affect egg freshness, quality, and perhaps human safety.

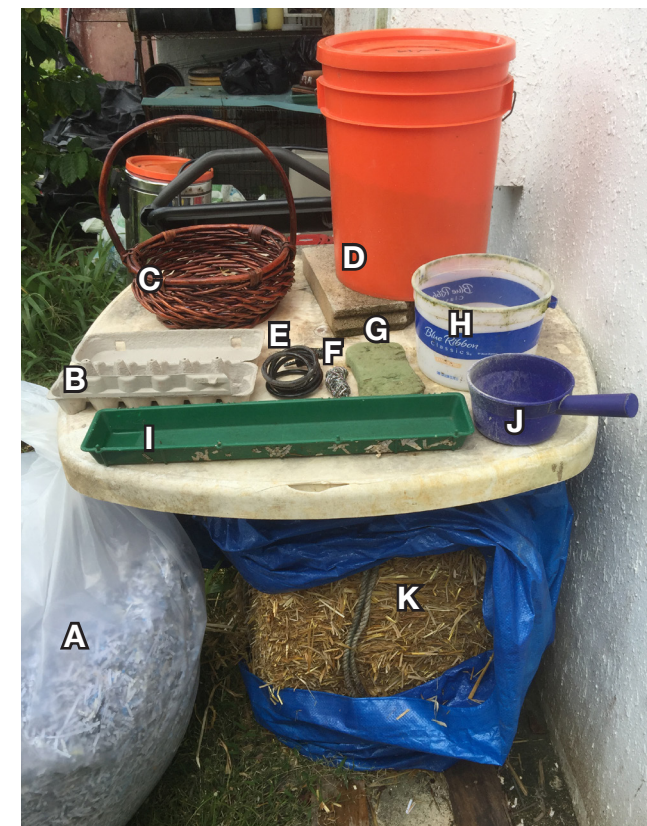


Fig. 4. Kit includes:
a. Shredded office paper
b. Egg carton (dozen)
c. Egg basket
d. Feed bucket with cover
e. Combination lock
f. Scouring pad (stainless steel)
g. Sponge
h. 1-gallon water container
i. Feeder (1'9" L x 5" W)
j. Scoop (3 cups)
k. Straw (125 lb. bale of hay)

- Sponge (1): A soft sponge with water and dish soap is used to clean feeders and water containers on a daily basis (factored into the 15 minutes of maintenance).
- One-gallon water containers (3): Twenty birds will need 3 gallons of water each day. The water must be clean and fresh every day. The container must also be sanitary and must be accessible to the chickens without causing risk of drowning, especially for baby chicks.
- Feeders (4): The feeder must have enough space for all 20 birds to have access to the feed at the same time (approximately 3 inches of linear space per bird) and must be deep enough to reduce feed waste (shallow feeders tend to increase feed waste because the animals knock the feed out of the trough). Bamboo makes good feeders; however, bamboo may be harder to clean. Plastic feeders are recommended because plastic is easier to clean and sanitize. Four feeders (1 ft. 9 in.) are required for 20 birds.
- Scoop (1): This is for dispensing feed to the feeders. A 3-cup scoop will fill up one feeder.



Fig. 5. Closer look at shredded paper and straw for floor bedding and nesting.

- k. Straw: One 125 lb.-bale of straw or hay is enough to provide nest bedding for one entire egg production cycle. The straw must be clean, kept dry, off the ground, and free of mold. Clean bedding keeps eggs clean. Store the straw in a dry place.
- l. Egg nests (2): An egg nest provides privacy and safety for the laying hen. An intact trashcan laid on the side is preferred to a laundry basket because it has one closed end. (One 16-gallon trash can per 10 chickens; or 1 laundry basket with dimensions of 1'5" W x 1'10" L x 10" H per 10 chickens).
- m. Storage/Transport crates (2): For egg-safety reasons, polyethylene stackable crates may be needed if 8, or more, cartons need to be transported.
- n. Perch (1): Chickens like to perch, especially at night because it provides them a level of comfort from predators. Provide a long, sturdy perch (8 to 10 ft. long). Tangantangan, bamboo, or a metal pipe will do (about 8 inches per bird, 2 to 3 ft. high from the ground, hung on the chain link parallel to the floor). The perch should not be able to move or swing.



Fig. 7. Chicken on litter (straw/shredded paper/grass cuttings) with tangantangan perch.

The Daily Routine

During the brooding period (day-old to about 8 weeks), chicks need to stay warm and protected from drafts. Feed and clean fresh water must be available at all times. Feeders and water containers must be cleaned daily. Dry fresh bedding/litter (this can be straw, shredded paper, wood chips, or grass from mowing or a combination) is added bi-weekly. Within a week or so of the start of the mini-chicken farm, most growers can do these tasks within 10 minutes.

During the growing period (about week 8 to week 18), provide clean fresh water at all times (minimum 2 gallons for 20 birds), and feed a commercial pullet ration (3 lbs. per day for 20 birds). Avoid overfeeding the pullets to prevent premature sexual maturity and avoid unnecessary fattening of the pullets. A pullet reared with excess feed will produce eggs early, and egg sizes may be extra-small to small. Also excess abdominal fat may interfere with optimum egg production. Dry, fresh bedding/litter is added weekly at this stage. These tasks can also be done within about 10 minutes.



Fig. 6. Nest with closed end to provide privacy (trash can).

During the laying period (from week 18 to 63 or more), provide clean, fresh water at all times (minimum 3 gallons for 20 birds), and feed 5 lbs. of commercial layer feed daily to 20 birds. Do not overfeed egg layers to reduce feed waste and control abdominal fat growth. Dry fresh bedding/litter is added twice a week. Eggs must be collected at least once a day to reduce the number of dirty and cracked eggs (eggs that stay too long inside the nest may become dirty or cracked due to hens stepping on them frequently). These tasks can usually be done within 15 minutes.

Health and Sanitation

Good sanitation practices are the best insurance against disease developing in a healthy flock! Keeping the premises dry with fresh, clean bedding/litter will improve hygiene and bird comfort. A wet and muddy litter (bedding) is a recipe for a disease outbreak. Feeders and water containers must be washed every day. Keep the facility free of rodents and insects such as fire ants. Minimize human visitors to prevent cross-contamination (because they may have been previously in contact with other fowl), and do not mix birds with other poultry such as boonie chickens, wild birds, or other fowl.



Fig. 8. Day-old chicks at arrival from post office inside shipping box.

Baby chicks are usually vaccinated at the hatchery to prevent some common viral diseases such as fowl pox, infectious bronchitis, Newcastle disease, or Gumboro. There is no cure for these viral diseases. Reducing bird density, improving ventilation, regularly adding fresh bedding/litter, and keeping feeders and water fountains clean (and sanitized) can limit bacterial diseases (such as *E. coli*) and diseases caused by protozoa (such as Coccidiosis).



Fig. 9. Pullets on wood chip bedding.

Things to be Aware of

- a. When adding the roof to the chicken pen, be sure to add extra pipes or wood sticks under the roof canopy to avoid water puddle formation as puddles may cause a collapse of the entire structure.
- b. Observe birds for alertness and vigor. Sick birds tend to stay isolated, are not active, and lose their appetite.
- c. Aim for a homogeneity in your flock by providing sufficient feeder and water fountain space for all 20 birds.
- d. Observe the color and texture of feces. Bloody or watery diarrhea is a sign of an infection.
- e. If a bird must be removed (called culling), observe the color of the shanks and the vent area to look for signs of laying: Shanks without pigmentation and a soft, pliable vent are signs of egg production. Also, comb and wattles are bright and turgid in hens during production. When birds are raised in groups on floor pens, culling requires closer observations of egg-laying signs to identify non-laying hens.
- f. Laying hens require 14 to 16 hours of light to stimulate egg production. That light does not have to be direct sunlight.

- g. A rooster is not required for hens to lay eggs and, in fact, can create many problems for hens. Keep roosters away from hens and hen houses.
- h. Hens will go into a molting season where feathers will be shed and egg production will decrease. The molting season may last several weeks, but hens will resume egg production when new feathers grow back (molting season on Guam is between October and December). Molting will generally happen after the first egg production cycle.
- i. Do not substitute layer feed with other feeds. Layer feed is formulated to provide the proper calories, proteins, calcium, and other nutrients required for egg layers.
- j. When you decide to raise birds, humane treatment of the birds under your care is imperative.
- k. Consult an extension agent or the Territory of Guam's veterinarian if you observe something unusual among your flock. Diseases should be reported to the Territorial veterinarian.



Fig. 10. Chicken manure and litter stored in 50 lbs. bags (in recycled feed bag).

The (Small) Business of Commercial Egg Production

Raising 20 laying hens could generate a modest income, and also provide fresh and locally produced eggs to your family and neighbors. Depending upon what can be recycled in the kit, profit margin can be substantial. The current model consists of buying all materials in the kit while still enough money is generated to pay for labor and management. A spreadsheet is available on the College of Natural & Applied Sciences website to help you run a cost/revenue simulation with variations of your liking. <http://cnas-re.uog.edu>

Publications > Useful CNAS Documents & Posters > Spreadsheets

Impact

The impact of this 20-layer project could improve our island's food security where one grower may provide eggs for seven households (one dozen eggs per household per week), which results in meeting about 65% of the island's need for eggs if supplied by 14% of the population engaged in this model.



Fig. 11. Banana plant fertilized with chicken manure and litter.

References

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Usam, S. 2014. "Some Common Health Problems of Poultry." Ministry of Food Production, Extension Training and Information Services Division, Trinidad and Tobago.