Sub. Code 18K3ZEL01 NME-I Poultry Science

Unit I:

India – Population of 1.2 billion people with a GDP growth rate of about 9% is the one of the biggest consumer market in the world.•India's livestock population is amongst the highest in the world.• The livestock sector contributes approximately 4% to GDP and27% to agricultural GDP.•Poultry contributes to 15% of total food energy and 5% of dietaryprotein. In addition to providing nutritional security to the poor, it offers provides direct and indirect employment to over three million people and have been one of the key contributors within the livestock sector.• The market size for Poultry Industry is estimated at around USD 7.9 billion (INR 350 billion) and is growing at an attractive rate of 12%-15% annually.• India is 3rd largest producer of eggs with annual production of 57 billion eggs & 5th largest producer of poultry meat with a production of 2.5 million tonnes of Poultry meat. Per Capita consumption of eggs in India is – : 52 Eggs• Per Capita consumption of Poultry Meat is – : 2.5 kg

Indian Poultry Sector –Strengths: • Global No. 3 Egg producer and No. 5 Poultry meat producer in the world• Eggs and chicken meat are the cheapest source of animal protein affordable by the masses.• Poultry products account for more than 75% of the non- vegetarian items consumed in India.• Industry growth rate of 12%-15% pa compared to a National GDP growth rate of 9%. Integration is taking over in broiler industry.• The key players are also moving into vertical integration by setting up retail chains, processing & marketing

Indian Poultry Sector -Challenges• Large wet market accounting for 80% of Indian Poultry meat sale.• Skills Deficit : 39 veterinary colleges, CPTI, BVR-IPMT etc. has not kept pace with growth of industry and demand for increase in efficiency at all levels of value chain• High cost of Logistics for Feed Ingredients (Corn and Soybeans). Logistics cost is as high as USD 500 to USD 625 for 10 tonnes. Inefficient farm management practices.• Lack of awareness on effective animal nutrition and health practices amongst farmers.

Indian Poultry Sector - Opportunities• Biggest consumer market in the world. Population of 1.2 billion consumers growing at a GDP of 9% pa• Bridging consumption gaps between NIN/NAC recommended 180 eggs & 11kg. When compared with current consumption patterns (52 Eggs & 2.5 kg of poultry meat) it presents huge opportunity for International players to tap the market.• Matching of above International standards i.e. 5 fold increase in egg and 10 fold increase in meat consumption has the potential to create 10 million jobs in the country. Most economical source of animal protein without any religious taboo.• Changing consumption patterns especially amongst the youths taking up egg and poultry meat on account of high nutritional value. This is huge opportunity as 30% of India's population is under the age of 30 years.• Fast paced growth of Organized retail in India currently 6% and expected to grow to USD 239 billion by 2015. This has resulted in shift from local wet market to organized retail.

Conclusion• Expansion in India is being driven by rising incomes and a shift in industry structure toward integrated ownership and coordination of the input, production, and marketing operations involved in poultry production(vertical integration).• These factors, in addition to government policies affecting will help shape future growth in the poultry industry in India as well as in emerging trade and investment opportunities for International players to tap the potential

Types of Poultry & Poultry Basics

This category consists of various domesticated birds each of which is used in various farm settings. The most common type is the chicken which is used at a number of commercial farms and at homesteads all around the world. The next in line is the turkey, which is used more often for the cuisine and other thanksgiving purposes. Most of the chickens and turkeys are used as a mode of nutrition, while the remaining fragments ar…

Poultry refers to any domesticated bird that is used for food. It is a term broadly used for birds such as ducks, turkeys, chicken, and even goose. It is believed that Chinese were the first people to raise or farm these birds and then subsequently it was brought to the Western world via Asia, Greece and Rome.

Almost all types of commercial layer poultry breed start laying eggs within their five to six month of age. They continuously lay about 275 to 300 eggs per year. Some strain lay about 330 eggs per year. Some highly egg productive breeds are leghorn, minorca, ancona, fayoumi, isa brown, babcock, star cross, lohmann etc.

Leghorn (White Leghorn): A Comprehensive GuideLeghorns or 'Leggerns' as they are known as in the US, are a heritage breed that is incredibly popular around the globe. A productive bird in virtually every sense, the Leghorn was used as a foundation to create most contemporary egg-laying breeds - but the original breed Leghorn breed is still a great bird for the backyard!

Lifespan; Because Leghorn chickens are productive egg layers, their lifespan is less than the average of a bird - they live to be around 4-6 years of age.

Class: Leghorn chickens are classed as a dual purpose breed, as they have enough meat to make a decent table bird, as well as being a productive egg layer. (They aren't as heavy as other dual purpose breeds like the Australorp).

Rarity;The Leghorn is a common breed in Australia, with many local breeders choosing to specialise in supplying this productive type of chicken. Therefore it shouldn't be difficult to find Leghorn chickens from hatcheries and breeders around Australia.

Origin: This chicken originates from The Port of Leghorn (hence the name) in Italy. They were later shipped America in the early 1800s, and then to Britain in the white form (which has remained the most popular variety), followed by the brown. It has now become one of the most important commercial egg laying breeds in the US, and is definitely an important one in Europe and Australia.

Fun Facts

- The Leghorn is the foundation breed for most chickens used in commercial egg production.
- Are often known to roost in trees, if they can fly up to the branches!
- The Warner Brothers character 'Fog horn Leghorn' is of course based on this beautiful breed of chicken!

Current Use/Purpose

Leghorn chickens are most popular for a dual purpose. They are a productive egg layer, producing between 280-320 eggs each year, they are a decent meat bird, and also make a sprightly garden pal!

Personality and Temperament

Leghorn chickens have a lovely, sprightly temperament, however aren't as cuddly or fond of being touched as other chickens. They prefer to just do their own thing and roam around the backyard, inquisitive and independent birds that they are. Not to say they can't be tamed - they certainly can and often do become domesticated backyard chickens!

The Leghorn can be a bit flighty, and can muster the wing strength to sometimes flap over small fences - so you may need to clip their wings in order to stop them from escaping.

Because Leghorn chickens are such productive egg layers, they don't become broody often, and are not reliable chickens for sitting on the eggs to term.

Incubating and Hatching

Because Leghorn chickens are such productive egg layers, they rarely display broody behaviour as this would cause them to cease laying. Therefore, if you want some little baby leghorns running around, you'll either have to buy them as baby chicks or incubate them yourself, which is great fun.

Egg Behaviour

Leghorns are egg-stremely prolific egg layers, one of the reasons why they were used as a foundation breed for the modern egg laying hen. They lay between 280-320 eggs each year, medium in size and white in colour.

Appearance

The Leghorn is a strong standing chicken with a relatively slender build. They have a large red comb with large earlobes, and a tail that points almost directly to the sky.

Care

The Leghorn is a fairly hardy bird that doesn't require much maintenance, however a few little extra bits of care should be taken with them.

The Leghorn can be flighty enough to clear low fences - so giving their wings a clip after every moult will keep them safe and sound in your backyard.

Also, if you live in an area with a particularly cold climate, be mindful of the Leghorns large comb, as it can be prone to frostbite. Therefore if the temperature reaches freezing, rub the chickens comb in vaseline - this can help protect it from becoming frostbitten.

Health Issues
The Leghorn chicken is a fairly average bird when it comes to health issues, however because they have such a large comb and wattle, they can be prone to frostbite.

Their productive egg laying does mean that their body wears out faster and thus their lifespan is shorter than the average bird.

Hardiness
Leghorn chickens are fairly hardy creatures that can withstand most climates and temperatures, hot or cold - another reason why they're such a great bird. Just remember, if the temperature hits freezing, keep an eye out for that comb!

Why We Love Them!
Leghorns are a beautiful bird that adds real personality to our backyard. Running around, happily foraging and free ranging, they're a delight to be around. Plus, we can't get enough of their delicious, fresh eggs that we enjoy all year round of course!

As well as the magestic leghorns, there are so many stunning breeds to choose from. It can be eggtremely confusing and difficult to find the perfect match for you and your family. From looks, to personality, to egg-laying talents - where should you begin?

Cluckily, our friends over at Chickenpedia have created an amazing Chicken Breeds Course. This extensive online course shares useful advice on choosing the right chickens for you as well as size & frequency of eggs laid. You'll even learn about their individual personalities, and be able to use their family-friendly compatibility scale through this well-structured program. It really is a great way to find your perfect backyard buddies which is why I highly recommend them to all of my readers! The courses are beginner-friendly and filled with vital information to help you raise a happy, *healthy* flock.

Rhode Island Red Chicken: Characteristics

Rhode Island Red chicken is an American dual purpose chicken breed which was developed in Rhode Island and Massachusetts in the mid 1840s. Rhode Island Red chickens are good egg layers but can be raised for both meat and eggs production.
They are also good as show bird. This breed is among the most popular chicken breeds for backyard flocks. They are highly popular mainly for their hardiness and egg laying abilities. Rhode Island Red chicken was from the Malay that it got it's deep color, strong constitution and relatively hard feathers.

Rhode Island Red Chicken

Breed Name	Rhode Island Red
Other Name	RIR, Rhode Islands
Breed Purpose	Dual Purpose
Breed Temperament	Aggressive, Calm, Friendly, Curious, Noisy, Easily Handled
Breed Size	Heavy (6.5-8.5 lbs)
Broodiness	Seldom (not prone to broodiness)
Comb	Large, Single or Rose Combs
Climate Tolerance	All Climates (very robust)
Egg Color	Brown
Egg Size	Large
Egg Productivity	Very Good (about 300 eggs/year)

Feathered Legs	No
Rarity	Common
Varieties	Only Recognized in Red

Layer Poultry Farming:

Layer poultry farming means raising egg laying poultry bitds for the purpose of commercial egg production. Layer chicken are such a special species of hens, which need to be raised. They start laying eggs commercially from 18-19 weeks of age. They remain laying eggs continuously till their 72 -78 weeks of age, They can produce about one kg of eggs by consuming 2.25 Kg of food during their egg laying period. For the purpose of producing hybrid eggs layer, consider the various categories of cock and hen before breeding. There are various types of highly egg productive layer breeds available throughout the world.

Layer Breeds:

According to the nature and colour of egg, layer hens are two types:

White egg laying hens: This types of hens are comparatively smaller in size. Relatievely eat less food and the color of the egg shell is white. Isa white, Lehman white, Nikchik, Bab cock BV-300, Harvard white, sver white, Hi line white, Bovanch white etc. are some popular white egglaying chickens.

Brown Egg laying hens: These are relatively larger in size. They eat more foods than white egg layers. Lay bigger eggs than other laying breeds. Egg shell is briwn in color. There are many types of brown egg layers available. Among those Isa Brown, Hi Sex, Lehman brown, Hi line Brown, Bab Cock BV-380, Gold line, Bablona Tetro etc are suitable for commercial layer poultry farming.

Layer hen Selection, Keeping chicks, Vaccination, keeping growing chicks, egg production from commercial layer farm, methods and importance of lip cutting, feeding, water management etc has to be carried out appropriately.

HOW TO CHOOSE POULTRY CAGES

WHETHER YOU ARE RAISING CHICKENS AS MEAT BIRDS OR AS LAYERS, YOU NEED TO CONSIDER WHAT KIND OF HOUSING YOU ARE PUTTING THEM IN.

When looking at commercial chicken rearing, whether you are raising chickens as meat birds or as layers, you need to consider what kind of housing you are putting them in. While there are a number of different types of situations for hobby chickens, there are only a few types of housing for commercial poultry production. Being familiar with these systems and their benefits helps you make a solid decision when you are laying out your production area.

CONVENTIONAL HOUSING SYSTEMS

Conventional housing systems are the most commonly-used system in poultry production in the United States. These poultry houses are small, each one housing between three to eight hens. They may be made of solid metal or mesh metal, and the sloped floor allows waste and eggs to roll and drop through to a conveyor belt. The water is provided through an overhead system, and food is supplied through a long trough that runs along the front of each cage. These poultry houses are typically arranged back to back, allowing for an increased number of animals caged per square foot of the space.

Conventional housing systesms may be arranged in a few different configurations. The most straightforward and space conservative configuration is the stack, where each house is placed on top of another in several long rows. In the pyramidal system, which is less space conservative but promotes more air flow, the houses are tired so that the front and the top of the house faces the air. Finally, in a floor installation, these poultry houses are simply spread out on the floor. While this installation is the least space conservative of all, it promotes better health for the chickens.

HOUSING FOR BREED

When you are thinking about the types of housing you should be looking at, first consider what kind of poultry you will be raising. For example, if you are invested in breeding meat chickens, choose a broiler cage, where the primary concern is feeding the chickens well. Compare this to a layer cage, where there are openings for the eggs to drop through. Conversely, if you are interested in breeding chickens for sale, you will need to look at parent stock cages, where the conditions are right for mating and the absolutely minimal egg breakage is the goal. If you choose to breed your chickens, don't forget that you will also need to look into rearing cages, where the size of the chicks is kept in mind.

If you are in a place where you are considering raising chickens commercially, choosing your housing system should be high on your list of priorities. Consider how many chickens you want to raise and what you think your production will be like from year to year. The type of poultry housing that you choose will also impact things like egg belts and manure belts, and you should think about what your resources are.

Choose the housing that best suit your needs. These cages go a long way towards setting the tone of your business, and the more thought you put into the process now, the better off you will be in the future.

System of poultry rearing :

In the annals of Poultry Development, one can see a gradual development in respect of the allotment of space, feeding, nutrition and in management etc. on the basis of scientific and technological developments poultry management moved from free range system to semi intensive system and then to intensive system.

Free range system: Birds are allowed free range, such that it can wander at will, over the allotted paddock or field and are not controlled by fences. Deforested land was used. 200 birds/acre allotted. In an ordinary land 100 birds/Acre was allotted. They received their bulk quantity of feed from the land in the form of herbage, seeds, insects etc. besides in small quantity by hand feeding. A small housing is provided for night shelter.

Advantages : 1. Maintenance on clean ground decrease the risk of disease. 2. Reduction in cost of management. 3. Birds get good amount of feed from the land 4. Cost of housing is less. 5. Soil fertility is maintained 6. Farming operation is not interfered with

Disadvantages 1. Losses are serious where predatory animals are abundant 2. Wild birds may consume much feed and they transmit disease. 3. Eggs may be lost when laid in hedge rows. 4. Impossible for adoption unless ample land is available.

Semi Intensive systems : Birds are provided with a pen and run. Pen is an enclosed house and run is an enclosed grass area with fence. As few as six to as many as 200 can be kept in are acre of land in this system. 3 to 4 sq.ft / bird in the pen. Floor level should be at least 10" from the ground level Advantages: 1.Complete control over operation 2.Useful for record purposes 3.Operational throughout the year 4.Economic use of land (free range) 5.Better protection during winter

Disadvantages 1.High cost in fencing 2.Danger of over stocking Intensive system 1.Deep litter system 2.Cage system The concept of deep litter system Birds are raised within four walls, over litter material which is of organic in nature capable of absorbing moisture and releasing moisture to the atmosphere and also to serve as a bedding material for the birds. Coirpith Paddy husk Ground Nut Saw dust Wood shavings straw chopping paper straw chopping sugarcane baggase When moisture is absorbed there will be controlled microbial activity and odour will also be minimum. Vit. B12 and B2 are available depth four inches at beginning. 6-8" – later Qualities of good liter material 1.It should readily absorb moisture 2.should not cause injury to birds. 3.Moisture level should be less than 15% 4.Should get decomposed and form good manure. 5.Should spread evenly 6.Should be non-toxic. 7.Should not cause dust pollution.

Advantages: 1. Land requirement is minimum 2. Easy and economic management 3. Scientific feeding and management 4. High degree of supervision. 5. Minimum Labour. 6. Automation is possible. 7. Manural value is increased.

Disadvantages If the management is bad, liberation and accumulation of ammonia, wet litter problem dirty eggs, disease problems may result.

Cage system : Battery cages. Very popular, called as Californian cage system. Birds are kept under total confinement with minimum space feed and water provided from outside. Eggs laid will get rolled out by the inclined floor bottom. Types of cages 1.Single 2.mutiples colony cages 20-30

Advantages : 1.Vertical expansion 2.Easy feeding and management. 3.Protection from Vermin and wild birds. 4.Litter borne disease are avoided 5.Spreading of disease minimum 6.Minimum area is required / bird. Single 1 /sq.ft. Multiple – 0.75 sq.ft. colony – 0.5 sq.ft. 7.Cleaner eggs. 8.Research data collection easier 9.Identification of birds, handling and culling of non layers easier. 10.Insects and pests controlled 11.Vices are kept at minimum 12.Birds are of softer flesh than the floor reared birds.

Dis-advantages. 1. High cost of installation 2. Breeding is not possible unless Artificial Insemination is practiced. 3. Cage layer fatigue or paralysis is a problem if not attended to. Housing management Poultry should be provided with a good housing which will facilitate 1. shelter 2. Protection from wild animals 3. Bad weather condition. Ideal housing helps the birds to perform well. To establish a viable poultry enterprise capital, land, labour and technical know how are essential.

The housing design should be flexible and it depends on 1.Age and stage of the birds. 2.Functional requirement. 3.The climate and environment. 4.For efficient supervision 5.Minimum structures to have efficiency. 6.Economy in construction.

Selection of site and construction of houses. 1. Hard soil type 2.elevated area should be selected for house construction 3.Cheaper in cost. 4.should have continuous water supply - good and wholesome. 5.Should be away from the urban area and also should be at an easy reach. 6.should have good road/rail facilities for transport. 7.should be easily accessible for supervisor 8.should have good ventilation 9.There should be freely available space for expansion. 10.Marketing- preferential 11.Management of brooder cum grower, layers, breeders should be specified in distinct areas to avoid crisscross movement of birds and inter current infection - such segments should be 100 feet away from each other. 12.Building should be constructed in east-west direction that is long axis should lie in east-west direction 13.Width of the building should be restricted to 30 feet and the length can be extended to the requirement. Height 10-12 feet. 14.North and South sides of the building should be fitted with wiremesh to permit airflow. 15.Roofs can be –thatch, Tiles, asbestos, light roofing or zinc sheet. 16.there should be minimum structures so that there could be good air movement 17.Manure pit and the incineration room should be constructed at the far end in leeward direction. 18.Farm house should be located at the entrance to minimize the movement of visitors into the deeper areas. 19.Agriculture operations can be combined with poultry farming. Desing of poultry houses. Shed – lean to roof Gable Half Monitor Full Monitor Flat roof houses.

kinds of poultry houses. 1. Brooder house. 2. Brooder cum grower house 3. Layer House 4. Breeder House 5. Broiler House 6. Cage House Layer Broiler Temperature Comfort Zone 10 -24 o C 21 -25 o C Optimum 13 -20 o C 24 o C Humidity Acceptable 50 -75% 50 -75% Preferable 60% 60%

In the United States, the top five states for egg production are: Iowa, Ohio, Indiana, Pennsylvania, and Texas*. Seventy-five percent of all egg laying hens are housed at farms that have more than 100,000 laying chickens on-site.** *Recommended: Common poultry terms and definitions.*

Most layer farms house birds inside buildings and use fans to maintain the preferred temperature and provide sufficient fresh airflow. These farms have strict visitation rules to minimize the transfer of disease into the farms. As a result, visitors are limited and there are strict clothing and sanitation protocols for those who need access (workers, veterinarians, feed delivery, manure applicators, etc.). Following these biosecurity rules reduces the risk for disease.

In the pictures below, you will see several layer hen farms. Photo 1 (hover your cursor over a photo to see the caption) shows a house with a paved area under the cages for the purpose of scraping and removing the manure every 3 days. Photo 2 is a high-rise house or multi-level building with the hens occupying the upper level and a manure collection or storage area in the bottom level. Photo 3 is a building with a manure belt and cage system (more on that later). Photo 4 shows a new set of cage-free buildings (photo taken in 2013). The rate of construction of cage-free systems has increased in response to consumer demands. As you can see, it is not easy to tell from the outside what type of production system is used inside the barns.

Since the 1960s, layer hens have been housed largely indoors and in cages. The predominant design, called a high-rise house, arranges cages in a manner that directs manure through a slot in the floor and into a storage area or manure pit in the lower level. Early designs utilized an A-frame arrangement. New houses being built are no longer of this type, but many of these buildings are still in use. Photo 5 below shows a row of cages in a more contemporary high-rise house.

Henhouse designs continue to evolve and most of the new buildings constructed in the past decade use manure belt systems (Photos 6 and 7) that handle and store manure differently than in the high-rise system (more on that below). Today, hens housed in manure belt systems account for about 50% of all U.S. egg production. Manure belts can be used with conventional cages, each containing around 8 birds and stacked one on top of another or with enriched colony enclosure cages (more below). The belt below each cage catches manure to prevent it from dropping on the birds below and then carries the manure away for storage outside of the hen house.
Enriched colony systems use large enclosures that contain around 60 birds and provide more space for each bird than in conventional cage systems. In cage-free systems (Photo 8) the birds can freely move throughout the barn. Fewer birds will fit into a cage-free building compared to conventional cages or enriched colony housing. Cage free systems are gaining popularity in the U.S. but at the present time (2016) hens housed in these systems account for less than 10% of U.S. egg production. As farms look to replace or remodel barns, industry experts expect enriched colony and cage-free systems to become more common.

A common characteristic of all these systems is that hens are kept under a roof and in a building to ease their care, handling, feeding, egg collection, and manure handling and removal. If the farm also stores manure in a covered structure, rain, snowmelt, and stormwater never come into contact with the manure.

The video below describes different housing systems and shows some diagrams and photos of battery cage, enriched colony, and cage-free systems. It also introduces manure management practices. The video is an excerpt of a webcast presentation by Dr. Hongwei Xin from Iowa State University.

POULYRY MANURE

Manure from layer housing is predominantly handled as a solid or semi-solid that is moist when excreted and then dries out, to varying degrees, during the manure movement and storage process. High-rise systems have two sections-the upper level where the hens are housed and fed and where they lay their eggs, and the dry, ground floor section below (Photo 9). The manure pit extends the entire length of the building and serves as long-term storage. Airflow in the building is designed to dry the manure and direct odors out through fans. Ventilation is important in these systems for several reasons, including the fact that it dries the manure, reducing the amount of ammonia produced and released. This improves air quality in the building and increases the nutrient value of the manure. The manure is generally removed once a year to be spread on crop fields, although some farms compost the manure and remove it more often.

The building in Photo 10 contains a paved alley and the manure is removed every three days. On this farm, the manure is moved to a composting area, but most farms move the manure to long term storage, which might be covered or uncovered.

As noted above, all new construction, including some cage-free systems, now use belts (Photo 13) to convey manure out of the building to a separate storage structure (Photo 11). As older buildings are remodeled, many are being converted to manure belt systems. Airflow in the building is set up to help dry the manure on the belts and manure is removed often, with 1-3 days being a common interval.

Less common housing systems for layer farms use flush or scrape systems to collect manure as a slurry or liquid. This is an older system and only about 5% of U.S. eggs are produced in this type of housing today. The manure from these systems is stored in a separate earthen, steel, or concrete structure outside of the housing facility. Many of these storage structures are managed as anaerobic lagoons to treat the waste. Liquid from the storage is sometimes recycled into the building to flush or clean accumulated manure and move it to the storage.

Any large livestock or poultry operation with more than a threshold number of animals at a location is subject to the manure management requirements of the Clean Water Act and specifically the Concentrated Animal Feeding Operation (CAFO) Rule. This federal rule, usually enforced by the state under federal authority, requires that rainwater or stormwater that comes into contact with animals, manure or feed be contained and managed to prevent discharges to surface water. In the case of layer farms, these federal requirements apply to farms with 82,000 or more hens if the manure is handled in a dry form. Most large farms are required to have a permanent structure or area for storing solid manure after it is removed from the layer houses (see Photos 11 and 12). Rules regarding the location, size, and other aspects of the storage can vary from state to state. Some states require the manure storage to be covered or on an impervious (concrete or lined) pad.

Most manure is applied to fields to fertilize crops or pastures (Photo 14). The vast majority of layer manure today is sold to third parties for this purpose although some egg producers still apply their manure to their own crop land. In all cases, a large layer operation is required to comply with the federal CAFO rule requirements. Chicken manure is rich in nutrients like nitrogen, phosphorus, and potassium, all of which are needed for plant growth. Solid manure is removed from the storage area and loaded into trucks or manure spreaders for application to the land applications sites. Depending on distance and accessibility to the field, manure may be hauled on public roads. Care is needed to prevent excessive dust and spillage during loading and hauling.

Ideally, manure is moved directly from the storage and applied right away to the field. This is not always feasible so another choice is to stockpile manure or temporarily store it in the field where it will be used (Photo 15). Again, typically, there are rules that govern whether or not.

Large layer operations often also include egg wash facilities (Photo 16). The eggs are removed from the houses and washed in a separate building. Automatic washers remove manure and other debris from the shells. The resulting liquid waste stream contains cleaning compounds and small amounts of manure, broken eggs, and other organic materials. This wastewater is piped or pumped to large tanks or holding ponds for storage (Photo 17). The wastewater can be pumped or trucked to fields for crop irrigation.

OTHER WAYS TO HANDLE MANURE

Are there new or emerging technologies that may be common one day? It is hard to know which will be common, but there are some innovative manure management technologies being used by a few layer farms.

One of the most recent and practical innovations has been made possible by the advent of manure belt systems in egg production. Manure on the belts dries out relatively quickly, which halts biological activity and therefore ammonia production and volatilization. Biological activity and ammonia loss is further reduced due to the manner in which belt-conveyed manure is stored-separately from the animal house. The surface area of the manure piles is greatly reduced compared to high-rise systems, decreasing manure contact with oxygen. The separate storage area improves air quality for the hens and the workers who care for them. The end result of this (ongoing) innovation is a stable manure that is lighter to handle and transport, and higher in crop nutrient value.

Pelletization of dried manure further stabilizes the material, reducing dust and allowing it to be handled like a commercial fertilizer product. Dry pellets flow better in transfer, transport, and application equipment. Pelletization can also increase the acceptability of the product as an organic fertilizer for residential or recreational (golf course) uses. The use of pelletization at layer farms is growing.

Many operations are finding the investment in supplemental drying (Photo 18) and pelletization to be economical given the growing recognition of the value of manure in increasing soil organic matter and increasing beneficial biological activity. Pelletized manure is an alternative source of nitrogen during times of high commercial fertilizer prices as well.

Black soldier fly (BSF) larvae . This is an alternative system that has promise, but requires additional research, development, and demonstration before use in commercial operations of any size. Black soldier flies are not pests the way we think of house flies or stable flies. They were first noticed on accumulated manure several decades ago when open-sided layer houses were common. Current research and development efforts with BSF focus on raising the larvae on animal manure, reducing the volume of the manure and its nutrient content. The BSF larvae retain many of the nutrients originally present in the manure and the larvae have been shown in research to be a good source of nutrition in animal feed. The nutrients in the manure get recycled into the animals through the larvae as a direct feed source and not into the grain that might otherwise have been fertilized with manure. BSF larvae are not currently (2016) approved for commercial sales but a farm may be able to produce larvae for its own use. At this time, recycling nutrients with BSF larvae is mostly used by small-scale farms but research continues to explore its applications to large, commercial operations.

UNIT 2

Poultry Management:

Facilities on a Poultry farm Facilities on poultry farms are related to the purpose of the farm. In general, all poultry farms share common facilities and equipment such as feeders and drinkers. However, depending on the purpose of the farm, some facilities vary. For instance, some meat production farms include slaughter house facilities. The purpose of having these slaughtering facilities on a broiler farm is to minimize cost and increase profits through vertical integration. Egg production farms are equipped with nest boxes if the breeders are raised on the floor, or, if raised in cages, automated belt systems are installed for collection of eggs. Hatcheries are equipped with incubators that maintain the eggs for 18 days and hatchers that keep the eggs for 3 days, both maintained at the right temperature and humidity required for hatching (Wood et al., 1998). Waste Handling Wastes are produced in all types of poultry operations. After poultry houses are cleaned and sanitized, the wastes should be confined in one area for later removal by specialized companies for composting or proper disposal to avoid contaminating the environment. This confinement area can be used for all types of wastes including litter from most poultry farms and un-hatched eggs from hatcheries (Wood et al., 1998). Poultry litter can also be considered to be a by-product with economic potential. At the end of a production cycle in a broiler or egg-production operation, litter is removed mechanically from the poultry house, and can be used as fertilizers for crop production. Litter can also be 6 removed and sold to commercial processors for composting operations or nursery preparations. It can also be composted on the farm in a confined area, and then applied to farm lands. Management of Poultry Farms Feeding Feed costs have a major impact on the profitability of poultry farm operations. The high cost of feed is related to the energy and protein contents of the diet. In an unbalanced diet, with an excess protein, feed would cost more, thus increasing production costs. With low protein diets, chickens would take more time to grow, and could be at a higher risk of catching diseases. Chickens have different nutrient (feed) requirements depending on their type, age, and sex. Rations formulated to meet nutrient requirements produce faster growing, and healthier chickens, and thus better products and more profits (Dr. M. Farran, personal communication, 2009). Excess dietary nutrients are often excreted in the feces. The excess nitrogen and phosphorus in feces could cause a threat to the environment. For this reason, managing feed formulas for accuracy is an important step in the poultry farm management to safeguard the environment, and reduce operating costs (Karcher, 2009). Disease Management In the management of poultry farms, probably one of the most difficult phases is the management of the newly introduced flock. For the operation to be profitable, a good disease prevention program should be available for the newly introduced chicks to avoid any

future losses. Diseases can be transmitted via humans, other birds, newly introduced chicks, or contaminated equipment. Controlling diseases from the beginning is important for the success of the operation (Mobley and Kahan, 2007). 7 Vaccination Vaccination is an effective way to reduce the negative effects of diseases that can cause losses in a poultry operation. Diseases can be caused by viruses, mycoplasma, bacteria, fungi, protozoa, and parasites. Viruses are the number one cause of poultry disease and are considered to be the largest threat to poultry farms. Viral diseases can be reduced by proper sanitation on the farm, biosecurity measures, and vaccination of the chicks and chickens (Dr. M. Farran, personal communication, 2009). Viruses can cause several diseases; the major ones include: Marek's disease, Newcastle disease, infectious bronchitis, laryngotracheitis, fowl pox, fowl cholera, and avian encephalomyelitis (Jacob et al., 1998). Vaccination is mainly done to prevent Marek's disease, which can infect laying hens and hence, a whole flock if the eggs are infected. There are several vaccination methods. Some vaccines are administered via drinking water. Others can be sprayed, whereby the spray enters the nostril or the eye to form antibodies. Another way is by injection using an automatic syringe in the neck (Jacob et al., 1998). Chicks are usually vaccinated between 2 to 16 weeks of age, depending on the type of vaccine and disease. Some vaccines are marketed as mixtures to prevent more than one disease. More vaccination methods have been developed in the United States. For example in-ovo vaccination has made the process more labor efficient. This method vaccinates the embryo in the egg at the hatchery; after that there isn't any need to vaccinate again on the farm (Williams, 2007). Slaughtering and Processing In the final phase of the poultry operation, in both egg laying farms and meat production farms, slaughtering has to occur. In egg production farms, older hens must be culled when egg 8 production is reduced. The hen is either sold to another farm or, more commonly slaughtered. At the slaughtering facility, all poultry must be brought to a holding area where a good shelter with sufficient time for rest and water are provided before slaughtering (Wholesome meat and fish Act, 2005). Prior to slaughtering, all poultry are stunned using the correct voltage depending on size and weight of the birds. Slaughtering should be as humane as possible, allowing blood to drain for about 90 sec. after killing. Hot water at 82°C should be available to ease the removal of feathers. After the feathers are removed, the bird is eviscerated, washed, and the carcass is cut into pieces. The knives should be sanitized frequently to avoid disease transmission. After cutting and chilling of the chicken carcass, packaging takes place at an area close to the slaughter house. Packaged chicken meat is then stored in refrigerators before going to the market (Wholesome Meat and Fish (Slaughter-houses) Act, 2005). The U.S. poultry industry was faced with opposition in 2009 when animal rights activists questioned the slaughtering techniques used at some plants. Advanced slaughter machines are slaughtering at a rate of 6,000 broilers an hour. Even with this high number, the world still needs more chicken for consumption. How will market demands be met? A balance between efficient slaughtering technique and animal welfare must be established. Cleaning and Sanitizing After poultry are removed from the poultry house, it must be cleaned and sanitized. The sanitation process differs depending on the floor type and type of poultry house. Several disinfectants can be used to clean and sanitize the poultry house. However, the disinfectant must be chosen carefully to avoid problems with newly introduced flocks (Smith, 1999).

Grower and layer management

GROWER MANAGEMENT • Commercially 9-18/20 weeks are called growers. • This period is more critical. • Obtaining desired body weight ensures maximum production during subsequent laying period. • Faulty management may lead to under or over weights, lack of uniform growth, delayed maturity, prolapse, cannibalism and high grower house mortality. Proper cleaning and disinfection of grower house is needed before introduction of grower birds. • Growers may be reared in separate grower houses or continue to be reared in brooder cum grower house • Spread litter material to a height of 4" in case of deep-litter system. • Arrange feeder and waterers in the grower house. • Change the feeder and waterer according to the need. • Provide sufficient floor space, feeding space and water space. • Floor Space: 1260 cm2 (1.4ft2), In case of cages 54 sq.inches • Feeder space: 6-8 cm/bird • One linear feeder of 120 cm Length & 8cm depth--------40 grower birds

Water space : 2cm/bird • Circular waterer 36 cm H and 8cm D of 6ltr capacity- 50 growers • 100 birds-15-20 liters water/day. Grower mash/feed • CP-16% • ME-2500Kcals/Kg • Ca-1% • Approximately 60-80 g of feed/bird/day • Adopt restricted feeding programme during growing period to prevent fattening of pullets and early sexual maturity and thus to improve egg production. Uniformity • Aim for the uniformity of the flock. • Sample weights are taken once in a week to find out the average body weight as per the breeder suggestions. • At a given age, growing pullets should have average body weight very close to breeder recommendations and at least 70% of the birds' weight

within 10% of flock average. RESTRICTEDFEEDING • It is adopted during growing period of layers or breeders. • There are two types of restricted feeding 1 Quantitative fee striction 2 Qualitative feed restriction
Quantitative feed restriction • In which the amount of feed is reduced below the normal requirement of birds. • This can be done on day-to-day basis or skip-a- day programme or skip-two days in a week programme. • But this restriction depends on the matching of the flock average body weight with standard body weight provided by the breeder. • Quantitative feed restriction is usually followed in commercial breeders.Qualitative feed restriction • In which the quality of the feed is reduced below the standard requirement of the bird. • This can be done by including unconventional feeds or lesser nutrient feed ingredients in place of high protein or high energy diet. • Here the quantity of allotment to the bird is not restricted. • During restricted feeding programme, provide more number of feeders and see that all the birds are taking feed simultaneously or otherwise dominant birds will take more amount of feed and the weaker will be subjected to feed deprivation and hence the uniformity will be affected Advantagesof feed restrictionduring growing period • A considerable saving on feed cost because, only 80 % of the calculated feed requirement will be offered. • They are likely to consume less feed per dozen eggs even during laying period when they are offered ad libitum feed. • The pullets accumulate less fat and therefore produce more eggs. • It is easier to identify weaker birds at an early age during feed restriction.

Culling of such birds helps not only saving feed but also promoting layer house survivability because, healthier birds will be moving to laying house. • Layers feed-restricted during growing period have been found to produce eggs in longer clutches than those fed ad libitum.
Ighting management • Only 12 hours lighting programme is sufficient in case of open-sided houses. • No artificial light is needed.
Follow strictly the recommended vaccination, medication and other management programs like deworming, debeaking etc for the growers. • It would be better to repeat debeaking at 12-14th wks of age. • Deworming mostly done through the water • First deworming- 8wks of age • Followed by 16-18 wks of age

Deworming drugs • Piperazine • Robendol • Thiabendazole Round worms • Levamisole • Zodex • Pancure • Taenil • Helmonil Tapeworms • Dicestal • The most common medicine used is Piperazine 45%(0.5- 1ml/b) or 65% 370 ml/2000 growers • Levamisole. It is also immuno stimulant • Levamisole HCL 30% w/w-20-25mg/kg bwt Albendazole 10-15% is effective against all. 100g/1000 birds • Vaccination

Layer Management • System of housing • 1+3 system • 1 brooder cum grower house • 3 layerhouses • New brood of chicks obtained once in 20 wks • Growers shifted at 18-19wks • The batch interval is 20wks • Commercial large operations don't go for this system, 1+1+5 system • 1 Brooder house • 1 grower house • 5 Layer houses • New brood chicks purchased every 12 wks • Growers can be shifted earlier, For every 9 weeks new batch of chicks will arrive • The layers can be maintained in layer house for a longer period of time • This system is more useful in very large operationsFloor rearing • Proper cleaning and disinfection of layer house. • In deep-litter system, floor space of 2 sq.ft. per bird and feeding space of 5" per bird are provided • 6 feet linear feeder can be used for every 30 layers or 18" diameter circular feeder of 4-5 no for every 100 birds. • Watering space is just half that of the feeder space • Provide 18" diameter plastic waterer of 2 numbers for every 100 birds. • Spread litter material, in case of deep-litter system up to 6" thickness. • Arrange feeder and waterer in the poultry house to the height of birds' • Provide nest box for every 5 layers about a week before the first egg is laid. • Nest should be placed in the darker part of the house and clean regularly

There are three types of nest: • Individual nest – One nest box is sufficient for 4-5 birds. • Community nest – This will accommodate 50- 60 birds. • Trap nest – This will accommodate 1 bird at a time and is used for academic and breeding studies. • The nest should be provided with litter material. The litter material has to be replaced at least once in a week to prevent contamination of the eggs. • During night hours the nest should be closed to prevent sitting of birds in the nest. Cage rearing •Layer cages • Two types of stair-step layer cages are commonly used in open-sided poultry houses • Conventional cages • Reverse cageConventional cages Specifications for each box Front feeding length : 15 inch Front height : 18 inch Back height : 15 inch Depth : 18 inch; Reverse cages • Specifications for each box • Front feeding length : 18 inch • Front height : 18 inch • Back height : 15 inch • Depth : 15 inch • These cages can hold 3 to 4 birds. They are arranged either in 2-tier or 3-tier. • A slope of 1/6 is provided in conventional cages, where as in reverse cages the slope is 1/5. Advantages of reverse cages over conventional cages • More feeding space is available in reverse cages. So, all 4 birds can take feed at a time, where as in conventional cages, 3 birds can take feed and the other one is waiting at the back. • Number of cracked eggs is less due to lesser rolling distance. • Better ventilation in reverse cages than conventional cages.In cage system 3 birds/box of 18" x

15” cage floor space is provided (0.63 sq. ft per bird). Arrangement of cages • Cages are arranged in 2 0r 3 rows one above the other on either side, termed as californian cages • The known type arrangements in house is • 2 L and and M type • or • 2 L type and 2M type • or • 3 M type cages with L type cage normally fixed to the sides of poultry house

Lighting Management • Provide light stimulation at 18 wks of age starting with a minimum of 13 hr of day length • Increase light by 15-30 min /wk until 16 hrs of light is reached. • Light intensity- 0.9 -1.2 foot candle • Never decrease day length and light intensity during laying period

Timing for lighting stimulation • Lighting stimulation should not be provided until the flocks reach the optimum body weight of 1270-1360g or the weight described by the sp.breed • Flocks that receive light stimulation at sub-optimal body weight may lead to prolapse

Egg production • Egg laying starts at 20th week and the percentage of production increases every week to reach a level of 90% and above after 28 wks of age. Which is maintained up to 36 wks of age even up to 40-42 wks. • 28-36 wks peak egg production • Afterwards it slumps down slowly to reach 70% or belowby 72 wks. Feeding • Provide well-balanced layer mash. Phase feeding may be followed for layers according to age, level of production and climatic factors. • The average feed consumption during laying period ranges from 100-110 gram. • Feed consumption during winter increases and during summer, feed consumption decreases.

Nutrient Layer phase -I 21-45 wks Layer phase-II 46-72wks ME Kcal/kg 2600 2400 CP % 18 16 Ca % 3 3.5 Avail.P % 0.65 0.65 Lys % 0.7 0.65 Methionine 0.35 .30. Egg handling • The layer type chicken lay their eggs mostly during forenoon • Eggs may be collected twice in the morning and once in the afternoon • The frequency of egg collection has to be increased 4 to 5 times during peak summer • Air cooled rooms for storage of eggs • Specially designed card board trays have to be used. Deworming should be done regularly at an interval of 6-8 weeks depending on the worm load, especially when reared under deep-litter system. • Vaccination • Cull the unproductive layers regularly

LAYER PRODUCTION INDICES • Egg production The egg industry has two principal methods of measuring daily, weekly, and total egg production i.e. the hen-day and hen- housed systems. • Hen-Day Egg Production (HDEP) • For a particular day For a long period • This may be calculated by first computing the number of hen-days in the period by totaling the number of hens alive on each day of the period. • Then calculate the number of eggs laid during the same period. • HDEP is usually expressed in percentage. It is mostly used for the scientific studies and truly reflects the production capacity of the available birds in the house. • A farm average of 85% or more per year is desirable. Hen-Housed Egg Production (HHEP) • For a particular day For a long period

It is usually expressed in numbers. HHEP values of 80% or 295 or higher are desirable. • It a fails to account for past mortality, Egg size or quality. However, it is the best egg production index available and is universally used by the industry. • From a cost of egg production standpoint, HHEP is good as it measures the effects of both egg production and mortality. • If there is no mortality during a period, the HDEP and HHEP are equal.

Feed efficiency • Feed efficiency/kg.egg of mass=Kg. feed consumed _ one Kg. of eggs produced A value of 2.5or less is advantages to farm Feed efficiency/ Dozen eggs= Kilograms of feed consumed 12eggs produced The value should be 1.65 or less

BROILER MANAGEMENT

INTRODUCTION • Broiler is a bird of about 8 weeks of age of either sex with an average body weight of 1.5 to 2.0 kg • Today India is the 5th largest producer of broiler meat in the world with an annual production of 2.47 million MT • Despite this achievement, the per capita availability per annum of poultry meat in India is only 2.96 kg (ICMR recommendation is 11 kg) 3Source: NABARD.. Broiler Management • It is the set of all management practices including housing, feeding, watering, vaccination etc. from receiving of Day Old Chick (DOC) to the day of selling them • It is necessary as poultry is highly prone to various diseases which often leads to heavy losses • Efficient management will lead to multifold increase in the production and profits 4

Broiler Management Pre-Arrival Housing Preheating Disinfection Litter Post-Arrival House Environment Brooder Management Nutrition Vaccination Schedule Carcass Disposal 5Pre-arrival management: Housing • Housing should be cost effective, durable and provide a controllable environment • Select a well-drained site that has plenty of natural air movement. • The house should be oriented on an east-west axis to reduce the effect of direct sunlight on

the sidewalls during the hottest part of the day • The main objective is to reduce the temperature fluctuation during any 24-hour period 6
Pre-arrival management: Preheating • PRE HEATING – The preheating must be sufficient to heat the whole surface area to a level of 28 – 30°C – Prevents ammonia production and anaerobic fermentation – According to climatic conditions, insulation of the house and quantity of litter, the preheating time can vary between 36hrs in summers and 48 hours in winters – Cold litter when the chicks arrive can be the origin of nephritis, diarrhea and leg problems 7
Pre-arrival management: Housing 8
Pre-arrival management: Housing • Stocking Density – In addition to the performance and profit considerations, correct stocking density also has important welfare implications – To accurately assess stocking density, factors such as climate, housing types, ventilation systems, processing weight and welfare regulations must be taken into account. – In warmer climates a stocking density of 30 kg/m2 is closer to ideal 9 House Type Pre-arrival management: Litter • LITTER – During brooding, the litter acts as insulation and comfort for the baby chicks – The type of litter used can be: shavings, chopped straw, rice hulls, recycled paper- should be dry, non corrosive and good absorbing – Shavings or chopped straw can be used in a temperate climate 2 kg/m2 in summers, 5 kg/m2 in winters – pre–warm the litter to eliminate condensation due to its contact with the cold floor 10
Pre-arrival management: Housing • ORGANISING THE HOUSE • This will depend on 3 principal elements: – The type of house and level of insulation – The heating system (whole house or local) – The watering system (round–type, nipple or trough) • Whole House – If the house is well insulated (or in a warm climate) use 80 to 100% of the house – start the chicks in the center of the house with a fence on each side, 2 – 3 meters from the wall 11Pre-arrival management: Housing • ORGANISING THE HOUSE – For 1000 chicks: 5 plates , 5 new egg trays, 6 – 7 m of paper under the nipples 0.70 m wide, 40 – 50 nipples, 5 minicups Pre-arrival management: Housing • LOCALIZED HEATING – In poorly insulated houses, do not exceed 40 chicks per m2 in the brooding area (650 chicks in a 5 m diameter circle) – The placement of the equipment should be such that the chicks can always find water and feed 13
Pre-arrival management: Disinfection FINAL DISINFECTION: – Carried out 24 hours before the chicks arrive – Spraying of insecticide Permethrin 5.7% EC Spray, Dilute 7 tsp./gal or 1 qt/25 gal for .05% solution – Painting walls with Calcium Carbonate – Use 400 mL of Formaldehyde and 200 g of potassium permanganate for each 1000 cubic ft. of air space (28 cubic m). Fumigate for 24hrs – Footbath of calcium carbonate outside house and allowing entrance only of authorized workers
All In All Out System • All birds in the shed/farm should be of the same age group and preferably of the same breed and source of supply. If this is not possible minimize the number of age groups on the farm • This system is strongly recommended for maximum exploitation of genetic potential of birds • Efficient management, sanitation and vaccination programs become more complicated and less effective in multiple age sites 15Receiving the chicks • MANAGING THE FLOCK – The signs of a good quality chick are: – its activity – some chirping – absence of respiratory anomalies – a properly healed navel – Weight and uniformity are also important – Weigh 200 chicks at random for an accurate average 16
Receiving the chicks • THE FLOCK RECORD – In organizations where all information is required, this record should contain all the data about the flock • The principal data required: – Hatch date – Chick origin, donor flock, hatchery – Daily mortality split into its different types (heart attack, locomotion, etc.) – Bodyweight taken at their arrival and thereafter, each 5 days – Feed company, delivery date, type of feed, quantity – Daily feed and water consumption – The vaccination dates, batch number, treatment, products, quantity (dosage and dates) 17
Nutrition: Watering 29 Pan and Jar type Water basin Bell type automatic waterer Nipple drinker – The height of drinkers should be adjusted in such a way that the brim of the drinkers should be in a level corresponding to the bird’s backVaccination Schedule • For control of principle Viral diseases 30 Disease Age Route Strain Marek's disease 1 day SC Turkey herpesvirus and SB-1 Newcastle disease 1 day or Coarse spray B1 14–21 days Water or coarse spray B1 or LaSota Infectious bronchitis 1 day or Coarse spray Massachusetts 14–21 days Water or coarse spray Massachusetts Infectious Bursal disease 14–21 days Water IntermediaryCarcass Disposal • The immediate burning or burying of dead birds is an important part of a good disease prevention program • Dead birds act as a source of disease that can be spread by rats, dogs, mosquitoes, free flying birds and insects that may act as carriers of the disease. The two most acceptable methods are described below: 1.Incinerators 2. Disposal Pits\Carcass Disposal • Incinerators – A good incinerator is probably the best means of disposal, especially in an area where there is poor soil drainage or a danger of contaminating the water supply • Disposal Pit – Birds decompose fairly rapidly without the use of chemicals pit 6 ft. (1.83 m) in diameter and 6 ft. deep (1.83m) is large enough to take care of one 10,000-capacity broiler unit 32
When managing a healthy, productive flock, getting the lighting conditions right could be more important than you think. Melanie Epp checks in with the bright sparks who are shining a spotlight on the problem

In caged housing, laying hens respond well to artificial lighting. But as producers transition from traditional cages to aviaries, enriched colonies and free-range systems, questions about lighting have surfaced. Why is lighting important for poultry? And how do you choose the right lighting for each system? Two poultry specialists, Dr Ian Rubinoff, European account manager and technical services veterinarian at Hy-Line International, and Karen Schwean-Lardner, professor at the University of Saskatchewan in the department of animal and poultry science, share their expertise.

Why is lighting important for poultry?

In understanding why lighting is important in poultry production, it's necessary to look at the birds' biological make-up. In humans, light reaches the brain through the eyes. In chickens, light penetrates not only through the eyes, but also through the top of the skull, via the pineal gland, and through the pituitary gland next to the hypothalamus. Whereas in our eyes we have just three types of cones – specialised photoreceptor cells that are responsible for our perception of red, blue and green light – chickens have four: red, blue and green cones, as well as a cone for ultraviolet light.

Like humans, poultry's lives revolve around a regular day-and-night cycle. When birds have a proper day and night cycle, they develop the proper diurnal rhythms – that is, a routine of typical activities during the day. This is important for functions like melatonin production. "It is a normal cycle that is so important for birds because it drives things like immune function and growth rate and reproductive hormones," explains Schwean-Lardner. "By giving that day-and-night cycle, you improve the health of the birds, you improve the immune status, you improve mobility and you improve alertness."

"Birds tend to be more active when they have a day-night cycle," she continues. "They'll actually grow better, which is really interesting and the total opposite of what was thought ten years ago."

Schwean-Lardner is currently conducting research on the importance of day-night cycles in birds. She's looking at factors such as the age at which lighting programmes should start, how that change should be made and how abrupt versus gradual changes in lighting regulation impacts poultry. Her main area of interest, though, is day-night cycles. "Birds have to have darkness in my opinion," said Schwean-Lardner. "How much will depend on a number of things."

Poultry researchers are interested in three segments of the spectrum, each of which can have an effect on birds' behaviour: ultraviolet light, visible light and infrared light. Ultraviolet light is towards the short end of the spectrum. The wavelength of visible light ranges from 400 nanometres (nm) to around 700 nm. Infrared light's wavelength is longer than the light we can see, measuring above 700 nm. While humans can see in the range of 400–750 nm, chickens can see in the range of 315–750 nm. Additionally, chickens can see higher peaks at the spectrums of around 480 and 630 nm, said Rubinoff.

Using a standard LED spectrometer – an instrument that measures the intensity of light at different wavelengths – we can have the ability to measure light in four different ways, Rubinoff explained during a talk at the International Egg Commission's Global Leadership Conference in Bruges earlier this month. We have CCT or 'correlated colour temperature', which is measured in Kelvin (K). "This is a great rough indicator for telling if a light is warm or cool," Rubinoff explained. "Under 3,000K gives an indication that it's a warm light, and above 4,000K gives an indication that it is a cool light."

"This doesn't give any indication as to the quality or composition of the light, but it gives a rough calculation," he said.

Short for 'colour-rendering index', CRI is a scale from zero to 100 per cent that expresses how accurate a given light source is at rendering colour when compared to a reference light source.

Light is also measured in lux, the standard unit for illuminance, or the amount of light striking a surface over a given area. "It is important to remember that lux is measured at a point of space," said Rubinoff. "What I measure here for light intensity is very different than what I measure down here. A change in even as little as 10cm can change your lux and light intensity by quite a bit."

“This is something that is very difficult for us, especially as humans, to understand,” he continued.

The last measurement is the peak wavelength, which simply describes the dominant colour from among all the wavelengths being emitted from a particular light source.

How lighting is used in the different environments

On a typical sunny day we can see as much as 150,000 lux of light intensity, which means that chickens with access to the outdoors are exposed to a very high level of light intensity. As the sky gets cloudy, a little bit of the daylight’s red spectrum is obscured and it becomes dominated by the blue spectrum. When the sun sets or rises, we see the opposite. We see an increase in the red spectrum and a decrease in the blue spectrum.

Incandescent light is more or less like a small fire inside a glass bowl, Rubinoff explained. Incandescent lights provide a nice spectrum for laying hens. Unfortunately, they’re incredibly inefficient, which is why producers have started moving on to other sources of light, starting with fluorescent bulbs.

There are three peaks of light in fluorescent light - red, green and blue - and that combination gives us a really nice white light which humans can see. Chickens, however, most likely perceive this differently and are able to pick out the different colour spectrums because of their superior eyesight.

LED lights are what we would call full-spectrum light, very similar to what we see in sunlight. In a typical LED bulb, the peak wavelength within the blue spectrum reaches around 440nm. The distribution of light intensity across the rest of the spectrum varies from bulb to bulb.

How to choose the right bulb for your housing system

When it comes to traditional stacked deck or belted houses, for both caged and colony, the goal, said Rubinoff, is even light distribution at all levels. This is often overlooked in housing, he said.

“In some houses we put lights in every four metres and see this huge change in light environment by cage or by colony, without any consideration for what impact it may have on the chicken,” he said. “For anyone who’s considering putting in a new caged facility or colony facility, I would encourage trying to go for a consistent lighting profile where either you have a bulb that evenly lights all the levels or you have a linear light that gives no gaps in light intensity between the different areas.”

“We’ve certainly seen a huge increase in production as we got lights that went all the way down to the bottom,” he continued.

Conversely, when we have just two or three cages, we need a less directional light and a broader light.

One of the big challenges in devising optimum lighting conditions for the whole poultry industry has been working out how to manage an aviary system or a free-range system. Rubinoff believes that installing LED lighting in free-range and aviary systems provides more consistency than fluorescent light can provide. “There’s greater compatibility between the full spectrum of an LED or incandescent versus the spikes of a fluorescent bulb,” he said.

“In some internal research, we have noticed that when you move birds from an LED environment into a fluorescent environment there is a scare response in those birds,” he continued. “They really are frightened by the difference and change in that light environment, so consistency is key.”

For a long time now, we’ve used light to draw birds into aviaries. “The more we learn, the more we’ve found that with lighting aviaries you need flexibility,” said Rubinoff. “You need lights on different dimmers. You need lights on different timers so you can turn the lights on and off in order to utilise them to the best of your ability.”

More importantly, poultry producers need to make sure there are no dark areas in the system, said Rubinoff. Using light as a way to deter birds from laying eggs in a certain area has also proven to be very effective. “Usually we try to have lighter areas in the corridors and a little bit darker areas where we want the birds to go and nest,” he said.

Barn lighting is very similar to aviary lighting, except there aren’t as many areas that you need to be lit, so it tends to be a little simpler.

Transitioning to LED lowers energy costs

Rubinoff is always surprised when he meets farmers who continue to use incandescent bulbs. At an average cost of 10 US cents per kilowatt, replacing incandescent bulbs with a standard LED will provide return on investment in less than a month. Return on investment can change based on the variables, said Rubinoff.

“The fastest one I found was in 17 days your savings in energy paid for the LED bulb when you were using one of the less expensive LED bulbs,” he said.

In this example the LED bulbs chosen sold for US $2 each, while the incandescent bulbs cost US $0.75.

“So this is something I would encourage you all to look at,” concluded Rubinoff. “If you have any of the older style bulbs, look at the energy savings that you might be able to acquire.”

To Keep Your Chickens Cool During Summer

Spring has now past and we are slowly creeping forward into the summer. Whilst this is great for most of us as it means holidays and great weather, spare a thought for our two legged friends who often struggle in the heat.
Here in the US, we can expect to see temperatures soar over 100Fahrenheit in some places and believe us when we say, your chickens won’t be impressed…
Let’s take a look at how you can identify when your chickens have heat stroke and then our favourite 7 ways to cool them down during the summer.
Want even more treat ideas? Visit our chicken treat chart here.
.You will probably notice as the temperature gets over 90Fahrenheit their egg production will slow down and eventually stop as temperatures exceed 100Fahrenheit.
If you don’t take special measures during such heatwaves your girls will show signs of heat fatigue such as:

- Walking around with their beaks wide open.Lying on the ground with their wings spread.
- Eating little amounts of food.

We’ve had chickens now for over 6 years so our girls have seen their fair share of heatwaves and we’ve learnt a thing or two about how to help them during this time.
Let’s take a look at the 7 things you can do to cool them down and keep them laying eggs.

Ice Their Water

The first and easiest thing you can do is to sort their water supply out. Normally we just have a single 30 litre chicken drinker in their pen and this is fine for our girls most of the time.

However during heatwaves we replace their drinker with several shallow dishes. We scatter these dishes throughout the pen so the girls are always near water. The shallow dishes are also much easier to refill throughout the day to keep the water cool.

Freeze Their Feed

Once you’ve sorted their water supply out the second best thing you can is feed them cold or frozen food. Our chickens love: bananas, pineapples, watermelons, apples and strawberries.

We take these fruits, chop them into small pieces and freeze them. It should only take a couple of hours until they are frozen then you can feed them straight to your chickens.

Frozen Fruit For Our Chickens

Another favourite of our chickens is yogurt mixed with fruit. We feed them plain Greek yogurt and place some frozen fruit inside it. Just dump this yogurt out into their trough and watch them go crazy!

As well as feeding them the right food you need to make sure not to feed them the wrong food during a heatwave. Don't feed them Maize (diced corn) or scratch as this takes them a long time to digest and causes their body temperature to rise.

Give Them Shade

If your pen is anything like ours, it doesn't have any shade except the chicken coop- this is bad news for our chickens during heatwaves.

During our girls' first heatwave we noticed they were digging to try and get underneath the nesting boxes and that's when it struck us… they didn't have any shade.

We went out and bought a free-standing parasol for $20 and we now have two of them at either end of the pen. During the summer we set these parasols up and the girls love hiding underneath them during midday when the temperature spikes.

Get A Mister

So the parasol isn't quite cutting it for the girl? You can always get a misting attachment for your hose and leave this on during the day. Once you put the attachment on your hose just hang it down off either a tree branch or the top of your pen.

Friends of ours who've done this say it reduces the ground temperature by around 15 degrees- your girls will be jostling to get underneath it for sure!

We haven't done this because the weather never gets too much over 80Fahrenheit, but we have got this as a standby in case we ever need it!

Ventilate Their Coop

If you live in the hotter states (Florida, Arizona and California) then you might need to make adjustments to your chicken coop as chances are its heating up before you even let your chickens out into their pen in the morning.

To keep your chicken coop cool you need to allow for ventilation. The simplest way to do this is to fit a window into your coop and leave the window slightly open when they go to roost. This will give your chickens nice cool air throughout the night.

Baby Pool Time

Instead of using the misting method above, we decided to get out our old baby pool and fill this with ice cold water. Our girls came flying over and dunked themselves into the water when we set it up!

If you really want to make the water chilly you can place ice cubes into the water.

On a hot day you will find after a few hours the water inside the pool will heat up and need replacing. We'd recommend only using the baby pool once a day during early afternoon when the temperature spikes.

Frozen Gallon Jugs

If you don't have a spare baby pool, you can always make you own portable frozen water bottles.

Take a spare gallon milk jug and fill this up with water then freeze it. Once it's frozen solid, take it to your chicken pen and slightly bury it in their favourite dusting places. Place a small towel over the jug then let your chickens perch on top of the jug and cool down. For added effect make sure to bury the jug in shade.

We hope this helps keep your chickens cool during the heat wave. Be sure to let us know in the comments how you get on and if you have any other clever ways to keep your chickens cool during the summer.

Different Breeds – Different Results

Not all breeds are created equal and if you know you live in a climate that often sees extreme temperatures, be sure to research which breeds can handle the heat a bit better than the rest of the flock. Here are a few breeds that are little more sun-loving than others:Leghorns, White Plymouth Rock, Welsummers, Rhode Island Reds

Even though these breeds tend to fair well in hot temperatures, there's always a boiling point. In other words, there's it's always possible for your chickens to be too hot.

One of the biggest problems backyard chicken owners face during the winter months is keeping their egg supply going. If you've kept chickens during the winter months before, you will know that unfortunately, if you let nature take its course, **your hens will stop laying** completely during this period.

Keeping your hens laying during winter can be difficult and you will definitely need more than just additional lighting. However, after reading the second chapter of our definitive guide, you will know exactly what it takes to keep your supply of fresh eggs during the winter months.

Some of your chickens may stop laying eggs during the winter, but many will continue to lay throughout the cold months if they have everything they need. You may not even need to add lighting or special feed….as long as you're ok with a slower production rate. While chickens utilize more of their energy to stay warm during the winter, their egg factories don't stop completely (unless their basic needs are not being met). And it's not a cruel expectation to hope for eggs to continue during the winter… as long as you are providing for your birds. Before we look at how to make your chickens lay eggs during the winter months, the first thing we need to look at is, **should we make our chickens lay eggs** during the winter months? This is a question that many backyard chicken owners ponder.

Clearly, as backyard chicken owners **we don't raise chickens for commercial gain**. In fact, many times our backyard chickens become like our household pets! However, with that being said, many people raise backyard chickens for the sole purpose of eggs and they need this egg supply to continue during the winter months.

Hens Stop Laying During Winter

To make our hens lay eggs during the winter, we first need to understand why hens stop laying during this time period. We all know that one of the biggest reasons hens stop laying is because of the reduction in daylight. Hens need around 14 hours of daylight every day to lay an egg, and in the US during the winter months the average amount of daylight is only 9.5 hours.

Why, you might ask, does a reduction in daylight matter? Well this is because light cues inform your hens when to produce eggs. It is a survival instinct, because hens know that chicks won't survive during the winter, so their body stops sending eggs from their ovaries.

At this point you are probably realizing that hens lay eggs purely for reproduction purposes, not for scrambled or poached egg!

However **it isn't just a lack of daylight** that causes hens to stop laying eggs during the winter.

As the cold weather takes over, your chicken's body naturally has to work harder to keep warm. To work harder your chicken redirects their 'resources' (i.e. energy from food) to **keeping themselves warm instead of laying eggs**. A common mistake made by backyard chicken owners is to not increase their chicken's feed during the winter months. This reduction in available energy means your hens don't have enough energy to continue laying eggs. So during the winter months you need to make sure that you increase the amount of feed available for your chickens. The best way to understand eggs is to imagine them at the tip of a pyramid: the only way you can have the tip (eggs) is to make sure you have the correct foundations (food, water and daylight).

We are now starting to build a picture of several separate reasons why your hens stop laying eggs during the winter time. If we control these factors (food, water, daylight and temperature) then we can start to expect our hens to continue laying eggs. Food and Water are large topics (each has their own chapter). Once you've read those chapters return to this point and learn how to control the final element, **lighting.**

Artificial Lighting in the Coop

Many chicken keepers, and most commercial enterprises, keep their flock under lighting through the winter. This ensures egg production will be maintained at optimum levels for all twelve months of the year.

Chickens need twelve to fourteen hours of daylight to keep production running, and the only way to provide this daylight during the winter is to use artificial lighting.

A 40w lightbulb (**make sure you don't use a fluorescent lightbulb**) provides enough light for a 10 x 10 coop. Make sure that the lightbulb is securely fitted- I'd also use a second fitting just in case the first fixing fails and your light falls onto the floor. For the fixing use either wire or chain mental, pests such as rats can chew through string. When fitting the light source make sure it's kept out of reach of the chickens and away from dry bedding/other potential flammable material.

Once the lightbulb is fitted, you can use a timer to set the lightbulb to come on from 4am-8am. The artificial light needs to be added in the morning as opposed to the evening to avoid stressing the birds.

Throughout winter you need to match the sunset time to your artificial lightbulb timer to make sure your hens' daylight stays consistently at around 14 hours. So as we move further into winter, you will need to leave your lightbulb on longer to maintain the 14 hours a day. But as we get closer to February and the natural daylight starts getting longer, you will want to reduce the length of time you leave the lightbulb on for.

Each morning make sure that you check the lightbulb works – during the cold nights lightbulbs don't last very long! If your lightbulb is broke and doesn't get replaced, it's likely you will accidentally force your chickens into a molt. When replacing the broken lightbulb make sure you replace it with the same color bulb- if you're using a red light, don't replace this with a white lightbulb and vice versa.

Speaking of broken lightbulbs, you also need to have a back-up plan for power outages. Typically, you should expect to have at least 2 power outages each winter. I find battery powered camping lanterns can work well as a temporary backup whilst the main electricity supply is out.

Feeding Your Hens during Artificial Lighting

Whilst your chickens might be happy waking up at 4am when their lightbulb turns on, I'm guessing you aren't too happy waking up at 4am. That's why you're using a timer for the lightbulb!

It's fine your chickens waking up at 4am, but if you aren't letting them outside until the sun rises (at 8am), then your chickens are going to get bored during this time. This will often result in them pecking at each other's feed- a nasty habit which can sometimes be extremely difficult to stop.

To keep them occupied during these early hours you can leave some feed and water inside the coop when you lock them up at night. This way they can start eating and have something to occupy themselves with until they get let out.

Preserving Eggs from the Summer

You may decide that you want to give your hens a break during the winter months and that artificial lighting isn't for you- but you still want eggs during the winter months, right?

The only way to achieve this is to store some of the eggs from the summer months when your hens are laying lots of eggs. To store the eggs you have two options: you can either freeze them or store them in the fridge.

Storing Eggs in the Fridge

If you store eggs in your fridge they can last a surprising amount of time- Mother Earth News reports that eggs can last more than 3 months providing they are kept in a sealed airtight container. This means that if you hold back some of the eggs from the summer months, you can refrigerate them and eat these eggs during December, January and February when your hens have stopped laying eggs.

The bloom is a natural protective seal which protects the egg from bacteria. Unfortunately, when you wash the egg you remove the bloom and its protection against bacteria.

So when you collect your eggs and store them make sure you don't wash them! If the eggs are particularly mucky then wipe them with a dry cloth and **don't use any cleaning products.**

To keep track of when the egg was laid, you can use a pencil to write the date onto the egg.

Storing Eggs in the Freezer

If you need to store your eggs for longer than 3 months, I would recommend freezing them. Unfortunately, you can't just place the whole egg inside the freezer and leave it…To freeze an egg you need to separate the yolk and the egg white. Once you have separated the yolk and egg whites they need storing in separate plastic containers. To use the eggs again you just need to defrost them and blend the yolk into the egg white.

When I'm freezing the eggs I also like to bake the egg shells and feed them to my girls- it provides them with a great free source of grit during the winter!

History

Beak trimming was developed at the Ohio Experiment Station in the 1930s.[14] The original technique was temporary, cutting approximately 6 mm (1/4 inch) off the beak. It was thought that the tip of the beak had no blood supply and presumably no sensation. The procedure was performed by hand with a sharp knife, either when deaths due to cannibalism became excessive, or when the problem was anticipated because of a history of cannibalism in the particular strain of chicken. Cannibalism is a serious management problem dating back to the periods before intensive housing of poultry became popular. Poultry books written before vertical integration of the poultry industry describe the abnormal pecking of poultry:

Chicks and adult birds' picking at each other until blood shows and then destroying one another by further picking is a source of great loss in many flocks, especially when kept in confinement .... The recommendation of the Ohio Experiment Station of cutting back the tip of the upper beak has been found to be effective until the beak grows out again.[15]

Cannibalism has two peaks in the life of a chicken; during the brooding period and at the onset of egg laying. The point-of-lay cannibalism is generally the most damaging and gets most of the attention. The temporary beak trimming developed at the Ohio Experiment Station assumed that cannibalism was a phase, and that blunting the beak temporarily would be adequate

Current methods and guidelines

In recent years, the aim has been to develop more permanent beak trimming (although repeat trimming may be required), using electrically heated blades in a beak trimming machine, to provide a self-cauterizing cut. There are currently (2012) four widely used methods of beak trimming: hot blade, cold blade (including scissors or secateurs),

electrical (the Bio-beaker) and infrared. The latter two methods usually remove only the tip of the beak and do not leave an open wound; therefore they may offer improvements in welfare. Other approaches such as the use of lasers, freeze drying and chemical retardation have been investigated but are not in widespread use. The infrared method directs a strong source of heat into the inner tissue of the beak and after a few weeks, the tip of the upper and lower beak dies and drops off making the beak shorter with blunt tips. The Bio-beaker, which uses an electric current to burn a small hole in the upper beak, is the preferred method for trimming the beaks of turkeys. The Farm Animal Welfare Council (FAWC) wrote regarding beak trimming of turkeys that cold cutting was the most accurate method, but that substantial re-growth of the beak occurred; although the Bio-beaker limited beak re-growth, it was less accurate. It was considered that the hot cut was the most distressing procedure for turkeys

In the UK, beak trimming of layer hens normally occurs at 1-day of age at the same time as the chick is being sexed and vaccinated. USA's UEP guidelines suggest that in egg laying strains of chickens, the length of the upper beak distal from the nostrils that remains following trimming, should be 2 to 3 mm. In the UK, the Farm Animal Welfare Council stated: "The accepted procedure is to remove not more than one third of the upper and lower beaks or not more than one third of the upper beak only" but went on to recommend: "Where beak trimming is carried out, it should, wherever possible, be restricted to beak tipping; that is the blunting of the beak to remove the sharp point which can be the cause of the most severe damage to other birds.