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Egg Farming

In Ontario approximately 400 commercial egg farms supply over 200 million dozen eggs each year.

The Domestication of Hens

The modern chicken is descended from the wild Asian Jungle Fowl that anthropologists believe was first domesticated over 8,000 years ago. Originally hunted by early man, surplus birds that were caught were kept in captivity to supply fresh meat and eggs. Captive birds produced offspring and the domestication of fowl began. Eventually, domesticated fowl found their way through Asia and Africa to other parts of the world.

Canadian Developments

Egg production began in Ontario in the 1850’s when chickens and other types of poultry were brought from Europe. Before then only eggs from wild birds were available because it was considered impossible to raise poultry in Canada’s climate. Ontario farmers found they could raise domestic poultry if they gave them shelter from extreme winter and summer weather. Eggs were produced for the family and any surplus eggs sold to the local community.

Producing eggs remained a small farming sideline until the start of World War II. Higher production was encouraged to feed Canadian troops and for the "Eggs for Britain" campaign. This started the trend of larger-sized commercial farms and more poultry in total. Changing economics and new technology following the war kept this trend growing.

Until the mid to late 1950’s, egg production was seasonal. Chickens lay eggs in response to longer days. Eggs produced in spring and summer had to be preserved and stored for later sale in the fall and winter months when hens naturally slowed or stopped laying eggs. In 1938 researchers at the University of Guelph discovered that using electric light to make days seem longer would stimulate hens to lay eggs all year round. However, this knowledge was not widely used until...
Year-round indoor housing for poultry became practical. At about the same time, specialized breeds of chickens were developed for meat and for egg production. Using selective breeding, these single-purpose breeds soon replaced dual-purpose birds, and the management of laying hens and broiler (meat) chickens became different and specialized.

Raising poultry permanently in climate-controlled barns became possible and practical by the late 1950s. This was due to better transportation, egg packaging, more knowledge of poultry farming and nutrition, improved veterinary care, and new building designs. As flock performance and health became more important to egg farmers, raising hens on the floor gave way to laying cages. Although more costly and requiring more expertise and maintenance, farmers found that cage housing had advantages. They improved the quality of the egg, improved feed and water use, reduced mortality and cannibalism among hens, and eased the tasks of flock management and record keeping. Layer cage housing systems became the norm during the 1960s.

Canada produces enough eggs for all Canadians. In Ontario approximately 400 commercial egg farms supply over 200 million dozen eggs each year.

Egg production today uses modern science and technology to maintain and improve egg quality and safety, poultry health and welfare, and environmental protection while maintaining economic and production efficiency. Canada’s egg farmers are major financers of poultry research and development. They have also invested heavily in modern technologies and training to run their farms. However, these tools and knowledge still require good caretaker and management practices to be used effectively.
Breeding

The productivity of laying hens in Ontario has increased from less than 200 eggs per bird per year in 1950 to over 300 eggs in 2000. This increase is due entirely to selective breeding and advances in nutrition, disease control and management.

Commercial-sized poultry farmers no longer rely on the old traditional breeds of hens such as the Rhode Island Red and the White Leghorn. However, today's selectively bred “hybrid” strains originate from these pure breeds.

Breeding birds produce the laying hens that produce our eggs, so they are chosen for certain qualities that will be passed on to their laying hen offspring. These include: the quantity, size and quality of the eggs they produce, the small size of the bird, calm temperament, disease resistance, and their ability to convert feed efficiently.

For mating purposes, breeding birds are kept in floor-managed barns where they move freely in flocks that number in the thousands. The Recommended Code of Practice for the Care and Handling of Breeders recommends that mature breeding birds be kept at a density of 12 birds per square metre.

Most birds are now kept in climate-controlled buildings on floors with slats (narrow openings) to allow bird droppings to fall into a cleanout pit below.

Breeding birds are kept at a ratio of one male to 8-12 females. Mechanized feeding and watering equipment is used to deliver a nutritionally complete ration and clean water to the flock.
Hatching

Hatching (fertilized) eggs are produced when the breeding hens are between 24 and 70 weeks of age. Each bird will lay between 250-280 eggs of which 75-85% will be suitable for hatching.

Eggs are laid in nest boxes and are collected several times a day. They are sorted to remove soiled and damaged eggs. The eggs are put in shipping containers and stored at a specific temperature and humidity until they are picked up by the hatchery.

Hatching eggs are transported from the breeding farm to the hatchery several times a week in specially designed containers. Hygiene is extremely important. Hatcheries receive eggs and deliver chicks to many farms so there is a risk of spreading disease if an outbreak occurs. To prevent the introduction or spread of disease, hatcheries and breeding farms follow strict "biosecurity" procedures for people, vehicles and equipment.

Once at the hatchery, the eggs are graded for size and quality, and placed in trays. The trays are placed in incubation cabinets called “setters” where they spend 18 days before being transferred into hatching cabinets.

Temperature, humidity and ventilation are critical for successful incubation. Commercial incubators hold 100,000 eggs or more and have computerized heat controls and turning devices. For the first 18 days of incubation, the eggs are turned frequently by automatic tilting of the egg trays. In nature, this would be done by the hen on the nest to prevent the embryo from sticking to the inside of the shell.

Three days before the chicks are due to hatch the eggs are moved to hatching trays and placed in hatching cabinets. Again, temperature, humidity and ventilation are strictly controlled. Hatching occurs on the 21st day.
Rearing

Once they have hatched, the day-old chicks are sorted from the unhatched eggs. The sex is determined by examining the wing feathers since they are different between males and females (see diagram).

The male chicks, called cockerels, are not required for egg production and are poor meat producing birds. They are humanely destroyed along with the unhatched eggs and used to make feed for zoos, fur farms and other animal facilities.

The female chicks, called pullets, are vaccinated to protect them against the more common and serious poultry diseases. They may also have their beaks trimmed at this time. This quick procedure trims the sharp tip of the upper beak removing the danger to other birds and handlers from pecking. They are then placed in special shipping containers for transportation to pullet farms in climate-controlled trucks.

Most chicks are raised in climate-controlled barns either in rearing cages or on floors covered with straw or wood shavings. They are given nutritionally balanced feed rations, supplemental heating, timed lighting and health care to help them grow to their full genetic potential. These birds grow quickly, reaching sexual maturity (egg laying age) by 18-20 weeks.

Diet

Pullets are fed a formulated diet that meets all their nutritional requirements. In Ontario, corn-based rations are the most common, but barley, oats and wheat can be used. Vitamins, minerals and proteins are added to the ration to make it complete. The ration is adjusted as the birds grow. Growth promotants and hormones are not used in poultry feed. Fresh water is available at all times and is supplied through group waterers or individual drinkers.

Heating

Heating units, called brooders, provide a source of heat to replace the warmth normally provided to the chicks by the mother hen. Young chicks chill easily so temperature and humidity control is important. Initial brooding temperatures are kept at 28°C to 32°C and reduced about 2°C each week for 5 or 6 weeks to 21°C.
Lighting
The ‘day-length’ the pullet receives during its growth affects the age it will reach egg-laying maturity and in turn affects egg size. Lighting also has an affect on mature body weight and feed consumption. Evenly placed lights are used in the barn to simulate day and night.

Ventilation
Proper ventilation ensures a steady supply of oxygen and the removal of moisture, carbon dioxide, ammonia and excess heat. Large fans and adjustable openings are built into the walls of pullet and laying barns to allow for continuous air movement without harmful drafts.

Disease Prevention
Ontario’s commercial egg and pullet farmers must adhere to a strict on-farm hygiene program. Before the chicks arrive, the pullet barn and equipment must be thoroughly cleaned, disinfected, and fumigated if necessary.

During rearing, the pullets receive a series of routine vaccinations against prevalent diseases to build their immunity. If a specific disease threat exists in the area at the time, pullets may be vaccinated against that as well. Vaccines are administered either by oral spray, eye drops or through the drinking water. Occasionally, vaccines may be given by individual injections. Birds reared on the floor must also be protected from intestinal disease caused by contact with coccidiosis organisms that live in manure. This is done by vaccination or by adding coccidiostat medication to the feed.

Sound management is also very important in disease prevention. Keeping the birds in a clean, comfortable environment and taking sanitation precautions with those working in or visiting the barn helps to minimize the chance of an outbreak or spread of disease.
At 19 weeks of age, the pullets are moved to laying barns. They are either moved to barns on the same farm or are sold to egg farmers who do not raise their own pullets. The birds (now called hens) begin laying eggs between 18-20 weeks of age. In a typical flock, egg laying increases until the age of 26-28 weeks when more than 90 percent of the hens are laying one egg a day. The rate of lay then tends to decline over the next 40 weeks.

Hens are kept laying for 52 to 60 weeks, over which time they can lay more than 300 eggs. Of these about 55% are large-sized eggs, 16% are extra large; 18% are medium sized; and the remainder are small and peewee. Eggs get bigger as the hen gets older. Pullets and young hens lay peewee and small sizes, old hens lay extra large eggs. There can be a wide variation in egg numbers and sizes, both between flocks and within flocks, depending on genetics, management, nutrition and other factors such as temperature.

At the end of the lay period, hens are sold to processing plants and used to make processed chicken products. The laying barn is thoroughly cleaned and disinfected before a new flock is moved in.

Feeding
In the first weeks of egg laying (up to 35 or 40 weeks of age) the bird is still growing and egg output is rising to its peak. These birds need to be fed with enough high quality feed to increase their bodyweight and to meet their egg producing needs. Rations are adjusted according to the age of the flock and rates of lay. Laying rations have the same ingredients as those used in pullet rations. Extra protein for growth and extra calcium for stronger bones and eggshells is added.
Water

Water forms almost 2/3 of the weight of each egg and makes up more than half a bird’s bodyweight. Water is also essential in controlling body temperature since part of the water they drink evaporates into the air they exhale giving a cooling effect.

The amount of water birds drink depends on several factors. These include: the type of watering system; the amount and form of the feed; the size of the bird; the rate of lay and the temperature. For example, birds may drink twice the water when the barn temperature is at 35°C than they would at 21°C.

The birds need ready access to clean drinking water. Farmers test their water quality and monitor their watering systems to ensure they are operating properly.

Health and Hygiene

Controlling poultry diseases is important for both human and animal health. It is now possible to prevent some poultry diseases by vaccinating pullets. Commercial flocks are usually vaccinated for prevalent diseases such as Newcastle Disease (fowl pest) and infectious bronchitis. Flocks may also be vaccinated for other diseases when there is a local risk. Adding probiotics (good bacteria) to the feed may also prove useful to prevent some types of diseases.
Some poultry diseases are only preventable by protecting the flock from exposure. Called "biosecurity", measures include restricting access by people and animals to barns, disinfection of equipment and vehicles, and taking proper barn management and hygiene precautions. By following these protection measures, some poultry diseases that used to devastate flocks are no longer a problem.

Infestations by lice, mites and parasitic worms can occasionally cause health problems for the birds. Regular monitoring and pest controls help to eliminate health problems and disease transmission. Laying hens that are not raised in cages must be given protection against coccidiosis, a serious poultry disease spread through contact with manure. Protection against certain parasites that live in the soil or litter is also provided to birds that are raised on floors or outdoors.

Treatable diseases and infestations, when they occur, are managed with appropriate medications under the advice of the flock veterinarian. Treatment requires a whole flock approach and is generally administered in the water or the air. Eggs from flocks under treatment are not sold to the public.

**Temperature and Ventilation**

Egg farmers aim to keep barns at a constant temperature of 21-24°C year-round. If temperatures rise too high or fall too low, the feed must be adjusted to make sure birds are consuming enough nutrients.

The ventilation system (as in pullet barns) helps maintain air quality and an even temperature throughout the barn. Controlled ventilation, along with insulation, is also used to prevent over-heating of the barn in summer and to keep it warm in winter.
Example of Light Program for Controlled Environment Barn

**Lighting**

Chickens lay eggs in response to longer daylight. In the wild, they would begin to lay in the spring and continue until autumn. Raising hens inside barns has the advantage of using controlled electric lighting to create optimum day length throughout the year.

At 16 weeks of age, the birds require a light increase to stimulate them into laying eggs. An increased lighting program is begun that convinces the hen that spring has arrived and it should lay eggs.
In Ontario, nearly all laying hens are kept indoors. Environment is controlled and food and water is provided. Indoor systems include the cage system and the floor system. Some floor systems may allow birds to have access outdoors, but little food is obtained from that source.

Outdoor systems are those where birds spend all or most of their time outdoors and where limited protection is provided. Birds may obtain part of their diet from plants and insects. An example is the free-range system. Free-range production, while possible in spring and summer is not possible in winter months and is impractical to use on commercial-sized farms in Ontario.

**The Laying Cage System**

Since it began in the 1950’s, the cage system has become the most common method of egg production on both commercial-sized and small-sized farms. Well over 90% of the eggs produced in Canada today come from this type of housing system.

Hens are placed in cages at the beginning of their lay cycle and are grouped together. Generally, hens are kept 3 to 7 per cage depending on the cage design. Scientific evidence has shown that from both a productivity and behavioural point of view, hens do better when grouped together rather than kept individually in cages. The Recommended Code of Practice for Laying Hens recommends that cages be large enough to provide each bird with a minimum floor space of 432 sq cm. This allows all birds to rest at the same time. Overall cage sizes vary depending on how many birds it is designed to hold.
The typical laying cage system consists of rows of multi-tiered cages. Cages are made of either metal or plastic. They have mesh floors with a gentle slope so that eggs can roll to the front of the cage out of the reach of the hens to await collection. Manure droppings pass through the mesh floor. Depending on the design, manure collects onto conveyer belts, on the floor of the barn, or into a pit, to await removal.

Feed is automatically delivered several times a day in troughs fitted to the cage fronts. Watering equipment provides a constant supply of fresh water to each cage either through drinking nipples or watering cups.

Cage systems need to be designed for durability, bird safety, easy maintenance, and thorough cleaning and disinfecting. Some egg farmers are testing “enriched cages” to determine if they can meet these requirements. Enriched cages have dust baths, perches and/or nest boxes.

**The Floor System**

The floor system is used on some commercial and smaller-scale egg farms. These eggs are often sold as “barn eggs” or “free run” eggs. The birds are kept in barns or hen houses on a floor covered with a “litter” of straw or wood shavings, on wire or slatted floors, or a combination of both. Depending on the type of flooring, the Code of Practice for Laying Hens recommends a stocking density of 2-4 birds per square metre of floor space in the barn.

Good management to avoid high manure concentration and splashing or leakage from watering equipment helps to maintain litter quality. The right combination of litter material and manure droppings will break down in a composting process that kills most harmful organisms.

Damp litter promotes parasites and disease and is generally harmful to the health and comfort of the birds. Some barns are being redesigned with slatted floors where manure can drop through openings into clean-out pits below the floor. Eggs are laid in nesting boxes or laying areas shared by the hens and can be designed so the eggs roll away onto collection belts. The proper placement and design of automated watering and feed equipment prevents contamination and...
Egg Farming Systems

Temperature and ventilation control is even more important in floor systems. A balance is needed to ensure that litter remains dry and that dust and ammonia levels stay at acceptable levels without causing drafts or poor air circulation. Electric lighting programs are used and may or may not be supplemented with natural daylight.

The Free Range System

This system of producing eggs, while not widely used in Canada, is receiving renewed attention in some countries. While there is no established definition for the term "free range" in Canada, it is generally understood to mean a system where birds move about freely outdoors. This is usually limited to the daylight hours and birds are kept indoors at night or during severe weather. Birds have access to shelter, feed and water and nesting boxes. Some free-range systems, also called pasturing, confine groups of birds in movable pens with roofs to provide shelter from sun and rain. Free-range chickens may get as much as 30% of their food by grazing pasture and are given supplemental prepared feed and water. The Recommended Code of Practice does not provide stocking densities but in countries where commercial egg farmers use the free-range system, it is generally recommended birds be kept at a density of 150-300 birds per acre and that enough land be available to regularly rotate flocks onto new pasture.

Advantages and Disadvantages of Different Systems

There are advantages and disadvantages to each system. The most important factor in meeting the requirements for safe food, environmental protection and animal well-being is the level of management and care provided.

Laying Cages

The laying cage system was designed to provide the best health standards for hens while maintaining high productivity and egg quality. It continues to be the most effective way to meet the birds' requirements of adequate and nutritious food, clean water, good health and a clean, protected environment.

Advantages:

• Predators and parasites can be restricted,
• Disease risks are lower requiring less medical intervention,
• Eggs do not come into contact with soil and manure or with hens that can damage them,
• Hens are kept in small group sizes, reducing competition for feed and water. Recent research has shown that caged hens have lower levels of the stress hormone cortisol than hens that live on the floor,
• Reasons for its popularity with farmers are better control of diet, water and barn climate, allowing more high quality eggs to be produced at a lower cost, and with lower bird mortality.

Disadvantages:
• The high cost of installation and maintenance,
• The total dependency on mechanization and human care,
• Beneficial exercise is limited,
• Some natural behaviours are restricted.

Research continues into improving cage designs that would make them more compatible with the hen’s natural instincts and beneficial behaviours while still meeting production requirements.

Floor Systems
Advantages:
• Hens are allowed more freedom to roam. The added exercise can help improve muscle and bone strength,
• Birds can exhibit most of their natural behaviours such as dust bathing and scratching in litter or dirt,
• Equipment and maintenance costs can be lower depending on the degree of mechanization but labour requirements tend to be higher than for cage systems.
Egg Farming Systems

Floor Systems

Disadvantages:
• Hens are kept in large groups and develop a pecking order (order of domination between birds). This can result in bullying problems such as feather picking and cannibalism. Beak trimming becomes a greater necessity when these kinds of systems are used in commercial-sized flocks,

• Contact with manure, litter, or soil. The risk of certain disease and parasite infestations is higher when birds live in contact with litter or soil. This can mean more reliance on medications to prevent and combat health threats. Egg quality may be more difficult to maintain with floor (and free-range) systems since eggs can be laid in contact with droppings and dirt or be damaged by the hens,

• Keeping a good barn environment is more difficult when litter is used since manure is not removed as regularly as with cage systems. Slatted floors can solve some hygiene and air quality problems by letting most droppings fall away from contact with birds and eggs.

Free-range Systems

Advantages:
• Hens kept in a true outdoor free-range setting have the greatest freedom of activity,

• Free-range production requires the lowest cost for buildings and equipment but more land and labour is needed,

• There is no need for manure handling since manure droppings go directly onto the land. Flocks are moved regularly onto clean pasture to prevent land contamination.

Disadvantages:
• Birds are exposed to the greatest risks. Predators, weather, diet and nutrition, water quality, disease control, egg quality and collection can all be more difficult and labour intensive to manage and control,

• Flocks can only be raised outdoors during part of the year in most areas of Canada,

• Higher death rates and lower egg production can make this system more costly. This is reflected in the price of free-range eggs.

The type of management and care necessary will vary between the different types of systems used to raise eggs. No matter what type of egg farming system is used, proper on-farm management is the key to meeting the needs of consumers, the environment and the birds.
Eggs are either gathered manually or automatically, depending on the housing system and equipment.

Eggs may be collected by hand once or twice a day from the egg trough or nest boxes or automatically on conveyor belts that are run at least once a day. Eggs are moved to the end of the barn for sorting. They are sorted to separate the likely Grade A eggs from lower quality and damaged eggs and are placed in trays or flats that hold 2 1/2 dozen. The flats are stacked onto shelved trolleys for cooling and transportation. In Ontario, all commercial-sized barns have a cooler room located at one end of the barn where the eggs are kept until they are picked up for delivery to the grading station. At small farms without coolers, the eggs are usually kept in the barn egg room.

Depending on the size of the farm, the trolleys are picked up 1 to 4 times a week and transported in refrigerated trucks to the grading station.

Grading and Packaging

In Ontario, the law requires that all eggs sold through stores be graded. Most eggs are sent to a registered grading station before being resold to stores and restaurants. About 95% of the eggs produced in Ontario pass through commercial grading stations where eggs from various farms are inspected and packaged. Eggs can also be sold from on-farm grading stations. Whichever type of grading station is involved, the requirements and process are the same.
Egg Collecting and Grading

Eggs are washed with a detergent sanitizer solution, dried and may be oiled with a fine coating of mineral oil to seal the shell. The eggs are then inspected for quality by a process called candling. A trained operator scans the eggs as they pass over a strong beam of light that outlines the content of the egg and the quality of the eggshell.

Eggs showing stains and foreign particles are removed and used for pet foods and non-food products. Remaining eggs are graded A, B or C depending on their quality.

Grade A eggs are sized by weight and packaged for retail sale or for delivery to foodservice outlets and institutions. Grade B and C eggs are shipped to companies that make liquid and powdered egg products.

Commercial grading stations are fully automated. On-farm grading stations may use some manual handling.

Ungraded eggs can be sold directly from the farm where they were produced to individuals for their personal use. Since these eggs are not inspected, food safety regulations make it illegal for these eggs to be resold.
Egg production is highly regulated in terms of food safety, environmental impact and animal care.

Government and industry regulations and guidelines establish standards for the production, transportation, processing and marketing of poultry and their products.

Ontario’s industry-run Barn Standards Inspection Program was expanded to an On-farm Food Safety and Quality program in 1990. Salmonella control is now mandatory for all commercial egg farms including regular testing of barns and flocks. Food safety certification of egg farms is growing rapidly. Over 75% of all Ontario eggs come from certified farms or from farms awaiting certification. The number of farms certified under this verified food safety program will continue to grow in the future. To be certified, farms must meet a series of standards governing hygiene and sanitation, biosecurity, barn environment, animal health and welfare, manure handling and egg collection and storage.

Specialty eggs such as organic, free-run or nutritionally enhanced eggs are also produced in Ontario. The production methods used will vary according to the label claims. Some specialty eggs are certified by private organizations to ensure production methods meet specific requirements. There are no specific government requirements governing specialty egg production, however as with all eggs they must be inspected and graded for retail sale.

Government is responsible for conducting food inspection and testing of eggs at grading stations. Industry inspectors and all three levels of government work together to ensure retailers and food outlets meet the rules for selling eggs and egg products to the public.

Since 1991, Ontario has led the country in farm environmental protection programs. These include voluntary Environmental Farm Plans and mandatory Nutrient Management Plans and Water Quality programs.
National and provincial laws and regulations govern animal health and welfare. This includes the federal Health of Animals Act, the Criminal Code of Canada, the provincial Livestock and Livestock Products Act, and the Ontario Society for the Prevention of Cruelty to Animals Act.

The nationally recognized Recommended Code of Practice for the Care and Handling of Laying Hens is jointly developed and updated by farmers, poultry specialists, humane societies and government as a guide to meeting bird requirements at all stages of poultry production.

The Ontario Livestock Medicines Course and Pesticide Safety Course, government inspection and certification of feed mills, and government regulations for the sale and use of veterinary medicines and pest control products are all in place to ensure these products are used safely and responsibly.

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