US06DZOO26 (Poultry)

According to the World Watch Institute, 74 percent of the world's poultry meat, and 68 percent of eggs are produced intensively.[6] One alternative to intensive poultry farming is free-range farming using lower stocking densities. Poultry producers routinely use nationally approved medications, such as antibiotics, in feed or drinking water, to treat disease or to prevent disease outbreaks. Some FDA-approved medications are also approved for improved feed utilization.[7]

Egg-laying chickens[

Commercial hens usually begin laying eggs at 16–21 weeks of age, although production gradually declines soon after from approximately 25 weeks of age.[8] This means that in many countries, by approximately 72 weeks of age, flocks are considered economically unviable and are slaughtered after approximately 12 months of egg production,[9] although chickens will naturally live for 6 or more years. In some countries, hens are force moulted to re-invigorate egg-laying.

Environmental conditions are often automatically controlled in egg-laying systems. For example, the duration of the light phase is initially increased to prompt the beginning of egg-laying at 16–20 weeks of age and then mimics summer day length which stimulates the hens to continue laying eggs all year round; normally, egg production occurs only in the warmer months. Some commercial breeds of hen can produce over 300 eggs a year.[10]

Free-range

Commercial free range hens in the Scottish Borders

Free range chickens being fed outdoors

Main article: Free range

Free-range poultry farming allows chickens to roam freely for a period of the day, although they are usually confined in sheds at night to protect them from predators or kept indoors if the weather is particularly bad. In the UK, the Department for Environment, Food and Rural

Affairs (Defra) states that a free-range chicken must have day-time access to open-air runs during at least half of its life. Unlike in the United States, this definition also applies to free-range egg-laying hens. The European Union regulates marketing standards for egg farming which specifies a minimum condition for free-range eggs that "hens have continuous daytime access to open air runs, except in the case of temporary restrictions imposed by veterinary authorities".[11] The RSPCA "Welfare standards for laying hens and pullets" indicates that the stocking rate must not exceed 1,000 birds per hectare (10 m^2 per hen) of range available and a minimum area of overhead shade/shelter of 8 m^2 per 1,000 hens must be provided.

Free-range farming of egg-laying hens is increasing its share of the market. Defra figures indicate that 45% of eggs produced in the UK throughout 2010 were free range, 5% were produced in barn systems and 50% from cages. This compares with 41% being free range in 2009.[12]

Suitable land requires adequate drainage to minimise worms and coccidial oocysts, suitable protection from prevailing winds, good ventilation, access and protection from predators. Excess heat, cold or damp can have a harmful effect on the animals and their productivity.[13] Free range farmers have less control than farmers using cages in what food their chickens eat, which can lead to unreliable productivity,[14] though supplementary feeding reduces this uncertainty. In some farms, the manure from free range poultry can be used to benefit crops.[15]

The benefits of free range poultry farming for laying hens include opportunities for natural behaviours such as pecking, scratching, foraging and exercise outdoors.[16]

Both intensive and free-range farming have animal welfare concerns. Cannibalism, feather pecking and vent pecking can be common, prompting some farmers to use beak trimming as a preventative measure, although reducing stocking rates would eliminate these problems.[17] Diseases can be common and the animals are vulnerable to predators.[17] Barn systems have been found to have the worst bird welfare.[17] In South-East Asia, a lack of disease control in free range farming has been associated with outbreaks of Avian influenza.[18]

Free-run

Instead of keeping them in cages, free-run laying hens roam freely within an enclosed barn. This type of housing also provides enrichment for the hens, including nesting boxes and perches that are often located along the floor of the barn. Many believe that this type of housing is better for the bird than any caging system, but it has its disadvantages, too. Due to the increase in activity of the birds, dust levels tend to elevate and the air quality decreases. When air quality drops, so does production as this compromises the health and welfare of both birds and their caretakers.[19]

Organic

In organic egg-laying systems, chickens are also free-range. Organic systems are based upon restrictions on the routine use of synthetic yolk colourants, in-feed or in-water medications, other food additives and synthetic amino acids, and a lower stocking density and smaller group sizes The Soil Association standards used to certify organic flocks in the UK, indicate a maximum outdoors stocking density of 1,000 birds per hectare and a maximum of 2,000 hens in each poultry house. In the UK, organic laying hens are not routinely beak-trimmed.

Yarding

Main article: Yarding

While often confused with free range farming, yarding is actually a separate method by which a hutch and fenced-off area outside are combined when farming poultry. The distinction is that free-range poultry are either totally unfenced, or the fence is so distant that it has little influence on their freedom of movement. Yarding is a common technique used by small farms in the Northeastern U.S. The birds are released daily from hutches or coops. The hens usually lay eggs either on the floor of the coop or in baskets if provided by the farmer. This husbandry technique can be complicated if used with roosters, mostly because of their aggressive behavior.

Battery cage

Poultry farm using battery cages in India

Main article: Battery cage

The majority of hens in many countries are housed in battery cages, although the European Union Council Directive 1999/74/EC[21] has banned the conventional battery cage in EU states from January 2012. As of April 1, 2017, no new battery cages are able to be installed in Canada.[22] Farmers must move towards enriched housing or use a cage-free system. In 2016, the Egg Farmers of Canada announced that the country's egg farmers will be transitioning away from conventional hen housing systems (battery cages) and have no conventional caging left by the year 2036.[23] These are small cages, usually made of metal in modern systems, housing 3 to 8 hens. The walls are made of either solid metal or mesh, and the floor is sloped wire mesh to allow the feces to drop through and eggs to roll onto an egg-collecting conveyor belt. Water is usually provided by overhead nipple systems, and food in a trough along the front of the cage replenished at regular intervals by a mechanical system.

Battery cages are arranged in long rows as multiple tiers, often with cages back-to-back (hence the term). Within a single barn, there may be several floors containing battery cages meaning that a single shed may contain many tens of thousands of hens. Light intensity is often kept low (e.g. 10 lux) to reduce feather pecking and vent pecking. Benefits of battery cages include easier care for the birds, floor-laid eggs (which are expensive to collect) are eliminated, eggs are cleaner, capture at the end of lay is expedited, generally less feed is required to produce eggs, broodiness is eliminated, more hens may be housed in a given house floor space, internal parasites are more easily treated, and labor requirements are generally much reduced.

In farms using cages for egg production, there are more birds per unit area; this allows for greater productivity and lower food costs. Floor space ranges upwards from 300 cm^2 per hen. EU standards in 2003 called for at least 550 cm^2 per hen.[25] In the US, the current recommendation by the United Egg Producers is 67 to 86 in^2 (430 to 560 cm^2) per bird The space available to battery hens has often been described as less than the size of a piece of A4 paper. Animal welfare scientists have been critical of battery cages because they do not provide hens with sufficient space to stand, walk, flap their wings, perch, or make a nest, and it is widely considered that hens suffer through boredom and frustration through being unable

to perform these behaviours.[1] This can lead to a wide range of abnormal behaviours, some of which are injurious to the hens or their cagemates.

Furnished cage[edit]

Main article: Furnished cages

In 1999, the European Union Council Directive 1999/74/EC banned conventional battery cages for laying hens throughout the European Union from January 1, 2012; they were banned previously in other countries including Switzerland. In response to these bans, development of prototype commercial furnished cage systems began in the 1980s. Furnished cages, sometimes called 'enriched' or 'modified' cages, are cages for egg-laying hens which have been designed to allow the hens to perform their "natural behaviors" whilst retaining their economic and husbandry advantages, and also provide some of the welfare advantages of non-cage systems. Many design features of furnished cages have been incorporated because research in animal welfare science has shown them to be of benefit to the hens. In the UK, the Defra "Code for the Welfare of Laying Hens" states furnished cages should provide at least 750 cm^2 of cage area per hen, 600 cm^2 of which should be usable; the height of the cage other than that above the usable area should be at least 20 cm at every point and no cage should have a total area that is less than 2000 cm^2. In addition, furnished cages should provide a nest, litter such that pecking and scratching are possible, appropriate perches allowing at least 15 cm per hen, a claw-shortening device, and a feed trough which may be used without restriction providing 12 cm per hen. Furnished cages (Enriched) give the hens more space than the conventional battery cages, so that each bird may spread their wings without touching one another if desired. Enrichment such as nest boxes, perches, and dust baths are also provided so that the birds may carry out their natural behaviors such as nesting, roosting, and scratching as though they were outdoors.

Enrichment of laying hen cages ultimately results in better bone quality.[30] This is a result of the increased activity in the hens from the additional space and enrichment provided in the furnished housing system.

Although the enriched housing system has its advantages such as reduced aggression towards one another and cleaner eggs, modern egg laying breeds often suffer from osteoporosis which results in the chicken's skeletal system being weakened. During egg production, large amounts of calcium are transferred from bones to create egg-shell. Although dietary calcium levels are adequate, absorption of dietary calcium is not always sufficient, given the intensity of production, to fully replenish bone calcium. This can lead to increases in bone breakages, particularly when the hens are being removed from cages at the end of laying. Osteoporosis may be prevented by free range and cage-free housing systems, as they have shown to have a beneficial impact on the skeletal system of the hens compared to those housed in caged systems

Countries such as Austria, Belgium or Germany are planning to ban furnished cages until 2025 additionally to the already banned conventional cages.

Meat-producing chickens – husbandry systems[edit]

Main article: Broiler industry

Broilers in a production house

Indoor broilers

Meat chickens, commonly called broilers, are floor-raised on litter such as wood shavings, peanut shells, and rice hulls, indoors in climate-controlled housing. Under modern farming methods, meat chickens reared indoors reach slaughter weight at 5 to 9 weeks of age, as they have been selectively bred to do so. In the first week of a broiler's life, it can grow up to 300 percent of its body size. A nine-week-old broiler averages over 9 pounds in body weight. At nine weeks, a hen will average around 7 pounds and a rooster will weigh around 12 pounds, having a nine-pound average.

Broilers are not raised in cages. They are raised in large, open structures known as grow out houses. A farmer receives the birds from the hatchery at one day old. A grow out consists of 5 to 9 weeks according to how big the kill plant wants the chickens to be. These houses are equipped with mechanical systems to deliver feed and water to the birds. They have ventilation systems and heaters that function as needed. The floor of the house is covered with bedding material consisting of wood chips, rice hulls, or peanut shells. In some cases they can be grown over dry litter or compost. Because dry bedding helps maintain flock health, most growout houses have enclosed watering systems ("nipple drinkers") which reduce spillage.[331]

Keeping birds inside a house protects them from predators such as hawks and foxes. Some houses are equipped with curtain walls, which can be rolled up in good weather to admit natural light and fresh air. Most growout houses built in recent years feature "tunnel ventilation," in which a bank of fans draws fresh air through the house.

Traditionally, a flock of broilers consist of about 20,000 birds in a growout house that measures 400/500 feet long and 40/50 feet wide, thus providing about eight-tenths of a square foot per bird. The Council for Agricultural Science and Technology (CAST) states that the minimum space is one-half square foot per bird. More modern houses are often larger and contain more birds, but the floor space allotment still meets the needs of the birds. The larger the bird is grown the fewer chickens are put in each house, to give the bigger bird more space per square foot.

Because broilers are relatively young and have not reached sexual maturity, they exhibit very little aggressive conduct.

Chicken feed consists primarily of corn and soybean meal with the addition of essential vitamins and minerals. No hormones or steroids are allowed in raising chickens.

Issues with indoor husbandry

In intensive broiler sheds, the air can become highly polluted with ammonia from the droppings. In this case, a farmer must run more fans to bring in more clean fresh air. If not this can damage the chickens' eyes and respiratory systems and can cause painful burns on their legs (called hock burns) and blisters on their feet. Broilers bred for fast growth have a

high rate of leg deformities because the large breast muscles cause distortions of the developing legs and pelvis, and the birds cannot support their increased body weight. In cases where the chickens become crippled and can't walk farmers have to go in and pull them out. Because they cannot move easily, the chickens are not able to adjust their environment to avoid heat, cold or dirt as they would in natural conditions. The added weight and overcrowding also puts a strain on their hearts and lungs and Ascites can develop. In the UK, up to 19 million broilers die in their sheds from heart failure each year. In the case of no ventilation due to power failure during a heat wave, 20,000 chicken can die in a short period of time. In a good grow out a farmer should sell between 92 and 96 percent of their flock. With a 1.80 to a 2.0 feed conversion ratio. After the marketing of birds the farmer must clean out and prepare for another flock. A farmer should average 4 to 5 grow outs a year.

Indoor with higher welfare]

In a "higher welfare" system, chickens are kept indoors but with more space (around 14 to 16 birds per square metre). They have a richer environment for example with natural light or straw bales that encourage foraging and perching. The chickens grow more slowly and live for up to two weeks longer than intensively farmed birds. The benefits of higher welfare indoor systems are the reduced growth rate, less crowding and more opportunities for natural behaviour.

Free-range broilers

Turkeys on pasture at an organic farm

Free-range broilers are reared under similar conditions to free-range egg-laying hens. The breeds grow more slowly than those used for indoor rearing and usually reach slaughter weight at approximately 8 weeks of age. In the EU, each chicken must have one square metre of outdoor space. The benefits of free-range poultry farming include opportunities for natural behaviours such as pecking, scratching, foraging and exercise outdoors. Because they grow slower and have opportunities for exercise, free-range broilers often have better leg and heart health.[16]

Organic broilers

Organic broiler chickens are reared under similar conditions to free-range broilers but with restrictions on the routine use of in-feed or in-water medications, other food additives and synthetic amino acids. The breeds used are slower growing, more traditional breeds and typically reach slaughter weight at around 12 weeks of age. They have a larger space allowance outside (at least 2 square metres and sometimes up to 10 square metres per bird). The Soil Association standards indicate a maximum outdoors stocking density of 2,500 birds per hectare and a maximum of 1,000 broilers per poultry house.

Issues[edit]

Humane treatment[edit]

Battery cages

Chickens transported in a truck

Animal welfare groups have frequently criticized the poultry industry for engaging in practices which they assert to be inhumane. Many animal rights advocates object to killing chickens for food, the "factory farm conditions" under which they are raised, methods of transport, and slaughter. Animal Outlook (formerly Compassion Over Killing) and other groups have repeatedly conducted undercover investigations at chicken farms and slaughterhouses which they allege confirm their claims of cruelty.

A common practice among hatcheries for egg-laying hens is the culling of newly hatched male chicks since they do not lay eggs and do not grow fast enough to be profitable for meat. There are plans to more ethically destroy the eggs before the chicks are hatched, using "in-ovo" sex determination.

Chickens are often stunned before slaughter using carbon dioxide or electric shock in a water bath. More humane methods that could be used are low atmospheric pressure stunning and inert gas asphyxiation.[40]

Beak trimming

Main article: Debeaking

Laying hens are routinely beak-trimmed at 1 day of age to reduce the damaging effects of aggression, feather pecking and cannibalism. Scientific studies have shown that beak trimming is likely to cause both acute and chronic pain. Severe beak trimming, or beak trimming birds at an older age, may cause chronic pain. Following beak trimming of older or adult hens, the nociceptors in the beak stump show abnormal patterns of neural discharge, indicating acute pain.

Neuromas, tangled masses of swollen regenerating axon sprouts, are found in the healed stumps of birds beak trimmed at 5 weeks of age or older and in severely beak trimmed birds. Neuromas have been associated with phantom pain in human amputees and have therefore been linked to chronic pain in beak trimmed birds. If beak trimming is severe because of improper procedure or done in older birds, the neuromas will persist which

suggests that beak trimmed older birds experience chronic pain, although this has been debated.[1]

Beak-trimmed chicks initially peck less than non-trimmed chickens, which animal behavioralist Temple Grandin attributes to guarding against pain. The animal rights activist, Peter Singer, claims this procedure is bad because beaks are sensitive, and the usual practice of trimming them without anaesthesia is considered inhumane by some. Some within the chicken industry claim that beak-trimming is not painful whereas others argue that the procedure causes chronic pain and discomfort, and decreases the ability to eat or drink.

Antibiotics

Main article: Antibiotics in poultry farming

Antibiotics have been used in poultry farming in mass quantities since 1951, when the Food and Drug Administration (FDA) approved their use. Scientists had found that chickens fed an antibiotic residue grew 50 percent faster than controls. The chickens laid more eggs and experienced lower mortality and less illness. Upon this discovery, farmers transitioned from expensive animal proteins to comparatively inexpensive antibiotics and B12. Chickens were now reaching their market weight at a much faster rate and at a lower cost. With a growing population and greater demand on the farmers, antibiotics appeared to be an ideal and cost-effective way to increase the output of poultry. Since this discovery, antibiotics have been routinely used in poultry production, but more recently have been the topic of debate secondary to the fear of bacterial antibiotic resistance.

Arsenic

Poultry feed can include roxarsone or nitarsone, arsenical antimicrobial drugs that also promote growth. Roxarsone was used as a broiler starter by about 70% of the broiler growers between 1995 and 2000. The drugs have generated controversy because it contains arsenic, which is highly toxic to humans. This arsenic could be transmitted through run-off from the poultry yards. A 2004 study by the U.S. magazine Consumer Reports reported "no detectable arsenic in our samples of muscle" but found "A few of our chicken-liver samples has an amount that according to EPA standards could cause neurological problems in a child who ate 2 ounces of cooked liver per week or in an adult who ate 5.5 ounces per week." The U.S. Food and Drug Administration (FDA), however, is the organization responsible for the regulation of foods in America, and all samples tested were "far less than the... amount allowed in a food product.

Growth hormones

Hormone use in poultry production is illegal in the United States.Similarly, no chicken meat for sale in Australia is fed hormones.Several scientific studies have documented the fact that chickens grow rapidly because they are bred to do so, not because of growth hormones.

E. coli

According to Consumer Reports, "1.1 million or more Americans [are] sickened each year by undercooked, tainted chicken." A USDA study discovered *E. coli (Biotype I)* in 99% of supermarket chicken, the result of chicken butchering not being a sterile process.[67] However, the same study also shows that the strain of *E. coli* found was always a non-lethal form, and no chicken had any of the pathenogenic O157:H7 serotype. Many of these chickens, furthermore, had relatively low levels of contamination.

Feces tend to leak from the carcass until the evisceration stage, and the evisceration stage itself gives an opportunity for the interior of the carcass to receive intestinal bacteria. (The skin of the carcass does as well, but the skin presents a better barrier to bacteria and reaches higher temperatures during cooking.) Before 1950, this was contained largely by not eviscerating the carcass at the time of butchering, deferring this until the time of retail sale or in the home. This gave the intestinal bacteria less opportunity to colonize the edible meat. The development of the "ready-to-cook broiler" in the 1950s added convenience while introducing risk, under the assumption that end-to-end refrigeration and thorough cooking would provide adequate protection. *E. coli* can be killed by proper cooking times, but there is still some risk associated with it, and its near-ubiquity in commercially farmed chicken is troubling to some. Irradiation has been proposed as a means of sterilizing chicken meat after butchering.

The aerobic bacteria found in poultry housing can include not only *E. coli*, but *Staphylococcus*, *Pseudomona*, *Micrococcus* and others as well. These contaminants can contribute to dust that often causes issues with the respiratory systems of both the poultry and humans working in the environment. If bacterial levels in the poultry drinking water reach high levels, it can result in bacterial diarrhoea which can lead to blood poisoning should the bacteria spread from the damaged intestines.[

Salmonella too can be stressful on poultry production. How it causes disease has been investigated in some detail.

Avian influenza

Main article: Avian influenza

There is also a risk that crowded conditions in chicken farms will allow avian influenza (bird flu) to spread quickly. A United Nations press release states: "Governments, local authorities and international agencies need to take a greatly increased role in combating the role of factory-farming, commerce in live poultry, and wildlife markets which provide ideal conditions for the virus to spread and mutate into a more dangerous form..."

Efficiency

Farming of chickens on an industrial scale relies largely on high protein feeds derived from soybeans; in the European Union the soybean dominates the protein supply for animal feed,[72] and the poultry industry is the largest consumer of such feed.[72] Two kilograms of grain must be fed to poultry to produce 1 kg of weight gain,[73] much less than that required for pork or beef. However, for every gram of protein consumed, chickens yield only 0.33 g of edible protein.

Economic factors

Changes in commodity prices for poultry feed have a direct effect on the cost of doing business in the poultry industry. For instance, a significant rise in the price of corn in the United States can put significant economic pressure on large industrial chicken farming operations.

Waste management, manure

Poultry production requires regular control of excrement, and in many parts of the world, production operations, especially larger operations, need to comply with environmental regulations and protections. Different from mammalian excrement, in poultry (and all birds) urine and feces are excreted as a combined manure, and the result is both wetter and higher in concentrated nitrogen.

Waste can be managed wet, dry or by some combination. Wet management is particularly used in battery egg laying operations, where the waste is sluiced out with constantly or occasionally flowing water. Water is also used to clean the floors around nesting sites that are separate from open runs. Dry management particularly refers to dry litter such as sawdust that is removed as needed. Dry can also include open pasture where manure is absorbed by the existing soil and vegetation, but needs to be monitored dillegently so as to not overwhelm the ground capacity and lead to runoff and other pollution problems.

Both liquid sluicings and dry litter are used as organic fertilizers, but the wet bulk of liquids manure is harder to ship and is often limited to more local use, while the latter is easier to distribute in bulk and in commercial packaging.

Mortality

Mortality is a daily consideration for poultry farmers, and the carcasses must be disposed of in order to limit the spread of disease and the prevalence of pests. There are a variety of methods of disposal, the most common being burial, composting, incineration, and rendering. Environmental concerns surrounding each of these methods deal with nutrient pollution into the surrounding soil and groundwater – because of these concerns, in many countries and US states the practice of burial in pits is heavily regulated or disallowed.[77] Farmers may construct their own facilities for composting, or purchase equipment to begin incineration or storage for rendering.

Composting offers a safe and practical use for the organic material, while proper management of a composting site limits odor and presence of pests. Incineration offers a swifter disposal method, but uses fuel energy and thus brings varying costs. Rendering has the advantage of being handled off site, and the use of freezers can eliminate the spread of pathogens in storage awaiting pickup. Government organizations, like the USDA, may offer financial assistance to farmers looking to begin utilizing environmentally friendly mortality solutions.

Worker health and safety

Poultry workers experience substantially higher rates of illness and injury than manufacturing workers do on average.

For the year 2013, there were an estimated 1.59 cases of occupation-related illness per 100 full-time U.S. meat and poultry workers, compared to .36 for manufacturing workers overall. Injuries are associated with repetitive movements, awkward postures, and cold temperatures. High rates of carpal tunnel syndrome and other muscular and skeletal disorders are reported. Disinfectant chemicals and infectious bacteria are causes of respiratory illnesses, allergic reactions, diarrhea, and skin infections.

Poultry housing has been shown to have adverse effects on the respiratory health of workers, ranging from a cough to chronic bronchitis. Workers are exposed to concentrated airborne particulate matter (PM) and endotoxins (a harmful waste product of bacteria). In a conventional hen house a conveyor belt beneath the cages removes the manure. In a cage-free aviary system the manure coats the ground, resulting in the build-up of dust and bacteria over time. Eggs are often laid on the ground or under cages in the aviary housing, causing workers to come close to the floor and force dust and bacteria into the air, which they then inhale during egg collection.

Oxfam America reports that huge industrialized poultry operations are under such pressure to maximize profits that workers are denied access to restrooms.

World chicken population

The Food and Agriculture Organization of the United Nations estimated that in 2002 there were nearly sixteen billion chickens in the world. In 2009 the annual number of chicken raised was estimated at 50 billion, with 6 billion raised in the European Union, over 9 billion raised in the United States and more than 7 billion in China.

In 1950, the average American consumed 20 pounds of chicken per year, but 92.2 pounds in 2017. Additionally, in 1980 most chickens were sold whole, but by 2000 almost 90 percent of chickens were sold after being slaughtered into parts.

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