Alternative Poultry Production Systems and Outdoor Access

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Alternative poultry production is growing due to consumer demand for specialty products from cage-free and free-range birds. This publication discusses the differences between alternative and conventional production systems. Alternative production systems vary according to size but, in some countries, are standardized by specific definitions to assist in marketing. The various aspects of free-range systems in the U.S. and abroad are presented. Common poultry housing approaches are also discussed. Integration of poultry production with crop production on a diversified farm is an important part of sustainable agriculture, and birds can be integrated with vegetable production ("chicken tractor") and with grazing livestock, such as sheep. Organic poultry production is a type of alternative poultry production that is currently enjoying a growing market. Considerations surrounding organic production are presented. Production topics such as outdoor access and pasture management, pasture rotation, and predator control are also discussed.

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Outdoor access is an important part of most alternative poultry production systems.

Introduction

Alternative poultry production involves specialty systems such as a cage-free environment or other access to the outdoors as alternatives to conventional poultry housing and cages. Alternative poultry production may be large-scale but is often small-scale and integrated into a diversified farm. Alternative poultry production is an important part of sustainable agriculture to boost farm income while protecting the environment and addressing consumer concerns.

Outdoor access is an important feature of most alternative poultry production and allows the birds to express natural behaviors such as foraging and dustbathing. It allows "extensive" production in which the birds have access to ample space, sunlight, and fresh air—a healthy environment that reduces stress. The birds have access to comfortable indoor housing as well as the outdoors and can choose an environment, to maximize welfare. "Extensive production" is in contrast to "intensive production," where birds are permanently housed at a high stocking density.

The history of poultry production includes a long chapter on outdoor access. In the past, even the conventional poultry industry raised birds with outdoor access. Production moved indoors largely because of concerns about predators and disease, but also to allow production on an intensive scale with automated feeding and watering. Free-range producers must keep in mind the reasons production moved indoors and avoid practices that historically caused problems outdoors. (1,2)

Poultry production based on outdoor access is often seasonal, which can introduce variation in performance and product quality. Alternative poultry production is also often on a relatively small scale compared to conventional models, and may be more labor-intensive. Many producers attend to several small flocks instead of a single large one.

A lot of information is available on conventional poultry production. This publication

focuses on alternative production, for which information is less available. It contains real-life observations and highlights several innovative producers. This "how-to" manual addresses production systems and outdoor access for poultry. For information on breeds, nutrition, health, economics, etc., refer to other resources.

Alternative Poultry Production Systems

Defining production systems

Alternative production systems are defined in some countries in order to assist in marketing so that consumers will understand how the birds were raised. For example, in addition to maximum stocking densities for indoor and outdoor areas, the type of breed and feed may be specified. There are few definitions in the U.S.

The following classifications and general definitions constitute accepted terminology among both conventional and alternative poultry producers.

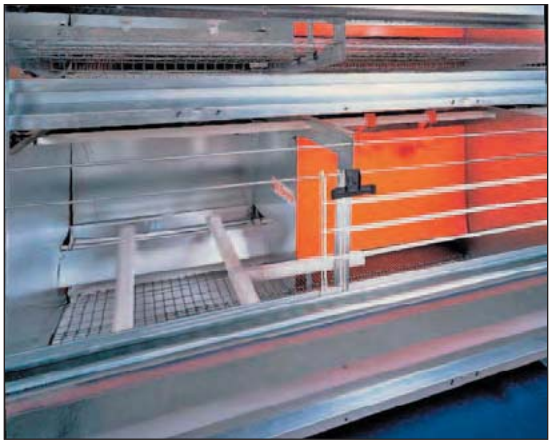
Layers

Poultry are mainly raised in the following ways for egg production:

- Cages
- Cage-free or "barn"
- Free-range

In the U.S., these are not regulatory terms. In contrast, in the European Union, they are "special marketing terms" with legal standards and definitions.

Cages. Indoor production is used by the large-scale conventional industry and is usually climate-controlled. Large houses allow intensive production and a high level of automation of feeders, waterers, etc. Layers are housed in cages in conventional indoor production, usually tiers of adjacent cages or "battery cages." Most U.S. producers provide 67 to 86 square inches per hen. (3) However, many consumers are concerned about the small amount of space in battery cages and the fact that birds cannot perform natural behaviors such as nesting, perching, and scratching. In the European Union (EU), battery cages will be banned by 2012. Only enriched cages can be installed, which provide more space (at least 116 square inches), as well as nesting, perch, and scratching areas. (4)



Enriched cage.

Cage-free. Cage-free layers are raised loose on a floor, which is generally covered with litter to absorb manure and allow birds to scratch. Eggs from cage-free layers are sometimes called "cage-free" or "barn eggs." Maximum stocking density should be no more than one bird per 1.5 square feet, but can be increased up to 1.2 square feet with slats and multiple levels of flooring on litter. (5) Slatted floors permit a higher stocking density since birds roost on the slats at night, droppings fall into a pit below, and less manure accumulates in the litter. However, some programs limit the amount of slats that can be used in the house in order to ensure birds have sufficient solid floors with litter for scratching.

Cage-free hens are free to scratch and roost.

Related ATTRA Publications

Poultry: Equipment for Alternative Production

Growing Your Range Poultry Business: An Entrepreneur's Toolbox

Pastured Poultry Nutrition

Parasite Management for Natural and Organic Poultry Production: Coccidiosis

Range Poultry Housing

Poultry Genetics for Pastured Production

In the EU, the "Barn" system requires 1.2 square feet per hen and 39 square inches of litter, along with perch space. (4)

Aviaries are specialty, multi-tiered buildings for cage-free layers that provide several levels of flooring and use vertical space (perches and platforms) to allow birds to jump to different levels. Aviaries can actually maintain a high density of hens.

Hens have access to multiple levels and scratching areas in aviaries. Photo by Environmentally Friendly Agriculture

Free-range. The U.S. Department of Agriculture (USDA) does not currently have specific regulatory definitions for "free-range," although the term is allowed on labels under certain circumstances. When applying for label approval, the producer must submit a brief description of the housing, which the

Free-range production is done either on a large or small scale.

USDA reviews to determine that poultry have access to the outdoors for at least half their lives. (6) In the EU, the definition for "free-range eggs" requires outdoor access with a maximum outdoor stocking density of 1 hen per 43 square feet (the equivalent of 1,000 hens per acre), and also requires the use of the housing in the "Barn" system described above. (4)

Meat Chickens

Meat chickens are generally raised in two ways:

- Indoors on litter
- Free-range

Indoor. The large-scale conventional industry raises broilers in houses. They are raised on the floor on litter, usually at a stocking density between 6.5 to 8.5 pounds per square feet (7), which is less than 1 square foot per bird. Sometimes birds are provided with additional space and marketed on the basis of having extensive space indoors.

Indoor production is also done on a small scale in developing countries. www.bridgesweb.org

Free-range. As mentioned, the USDA does not have specific definitions for free-range. (6) In contrast, the EU defines "Free-Range" and "Traditional Free-Range." These definitions specify maximum indoor and outdoor stocking density, the type of feed (70 percent cereal at finishing), the minimum slaughter age, and the amount of pophole space to encourage birds to go outside. "Free-range" limits indoor stocking density to 5.5 pounds per square feet and outdoor to 10.8 square feet per chicken (4,033 chickens per acre). "Traditional Free-Range" is basically the French *Label Rouge* standards and requires

The USDA does not currently have specific regulatory definitions for "free-range."

more space. (8) Stocking density is limited to 5.1 pounds per square foot indoors and 21.6 square feet per chicken outdoors (2,026 chickens/acre). It also requires the use of a slow-growing breed and limits the number of birds per house and the number of houses on a farm.

Outdoor access is also required in most organic programs in addition to the use of organic feeds, preventive health care practices, and a prohibition on the use of antibiotics. The USDA National Organic Program (9) requires outdoor access but does not specify stocking density or flock size. Instead, the standards are more descriptive, requiring fresh air, direct sunlight, the opportunity to express natural behaviors and exercise. In contrast, EU organic legislation specifies maximum stocking densities both indoors and outdoors. (10)

Outdoors, stocking density is used to maintain vegetation and reduce pathogens and excess nutrients.

See **Appendix 1** for recommendations and requirements for poultry production, detailed description of these programs with specific stocking densities, flock sizes, etc. **Table 1** summarizes free-range programs, using the original metric system measurements.

Stocking density/flock size In general, stocking density is related to bird welfare and carcass quality. Outdoors, stocking density is used to maintain vegetation and reduce pathogens and excess nutrients. Programs have specific stocking densities (see **Table 1** and **Appendix 1**), but as a general rule-of-thumb indoor maximum stocking density for meat chickens should not be more than 1 bird per square foot or about 6 pounds per square foot. For the outdoor area, the Soil Association recommends no more than 1,000 meat chickens per acre or 400 hens per acre on pasture that is rotated. (1,2) Cage-free layers should have at least 1.5 square feet per hen indoors on litter. (5) Meat chickens can be stocked at a higher rate than layers, because meat chickens are around for a shorter time.

Many programs limit the size of the flock or number of birds in a house. The Soil Association recommends that flocks be kept to 500 birds or less but allows flocks of 2,000 hens or 1,000 meat chickens. (1,2)

Free-Range Systems

Free-range systems vary widely, from large fixed houses with yards to small portable houses that are moved regularly.

The main free-range production systems are

- Fixed houses
- Portable houses
- Pasture pens
- Integrated systems

A fixed house and yard.

Poultry damage vegetation in a permanent yard.

Poultry can even cause erosion.

Fixed Houses

Advantages to a fixed house include the relative ease to provide electricity to power automated equipment. The house can also be large in size because it is not moved. Fixed houses open to yards to provide outdoor access, and birds are usually closed in the house at night. This type of production is done by most large free-range poultry companies in the U.S. and is sometimes called "semi-intensive." On a small scale, it is the familiar chicken coop and yard.

A major disadvantage of this system is that unless the birds are rotated from one yard to another, access to the same ground is continual. When birds stay on the same ground, they damage the vegetation and turn the yard into dirt or mud. Turf damage may be especially bad right around the house, and birds may track mud into the house and dirty the eggs. Excessive pathogens and nutrients can build up in the yard, contributing to disease and pollution.

A fixed house and yard may work in very dry climates, such as parts of the western U.S., where biological activity is low and pathogens do not survive, or with a low density of birds. (Young pullets or broilers are more susceptible to pathogens than older birds like layers.) Otherwise, it is critical to rest or rotate pastures to prevent these problems. If the house is fixed, a rotation should be used to rest the pasture.

One way to help rest or rotate pasture is "double yarding"—subdividing the yard in two with a fence and rotating the flock between the yards. The Soil Association recommends dividing the yard into at least four paddocks and planting trees or using shelters at least 30 to 60 feet away to draw birds from the area around the house, which is the most heavily used. (2) In the Soil Association program, the pasture must be rested for nine months after every laying flock (2); for meat chickens, the pasture should be rested at least two months per year, plus one year in every three years. (1) A layer of mulch or gravel around the house helps reduce mud outside the popholes and keeps birds from tracking mud into the house. Slats on either side of the popholes also help clean feet. Fencing may be permanent or temporary. Temporary fencing such as electronet fencing can be used and is easily moved to provide more yards.

Ideally, yards are covered with vegetation but sometimes are simply dirt scratching or exercise areas. Ground coverings such as gravel, straw, mulch, or sand are preferable to a dirt lot and help reduce mud. The area may even be completely or partially covered with a roof, making a veranda. Screens may be used to enclose the birds in a "winter garden" or curtains can be used. This allows access to sunlight and fresh air while protecting birds from weather and wildlife. In some cases, a screened porch with a mesh floor allows manure to pass through so it can be collected and removed.

A screened porch with a mesh floor.

A veranda provides a transition area to free-range or a winter garden. Photo by NFP Ledbury
www.nfpledbury.co.uk/products/poultry/commercial/veranda.htm

Young pullets or broilers are more susceptible to pathogens than older birds.

This mobile house has a roofed veranda with curtains that can be lowered in cool weather. Photo by SKA

Portable Houses

Portable houses have skids or wheels to move them.

Mobile houses are necessarily small since they are built to be moved regularly to a new location, usually with a tractor, pickup, all-terrain vehicle, or draft animal. Portable housing ranges from crude shelters to well-constructed, insulated houses. Houses may have wheels or skids and are moved every few days or less frequently.

Pastures usually have a perimeter fence to contain cattle or other livestock and deter predators. Generally poultry producers confine birds at night to protect them from nocturnal predators and the elements.

Moving the house at least once a week prevents the pasture underneath the house from dying. It recovers in about a month, depending on the climate. If the house stays in one location for longer than one week, the forage plants under the house may need to be re-seeded and it may take a couple of years to re-establish new pasture in that spot.

If a layer house has wheels (an "eggmobile"), it is usually moved often. Virginia producer Joel Salatin (11) popularized the use of eggmobiles in the U.S. His layer houses moved through pasture every three

Wheeled housing.

Eggmobiles.

to four days following grazing cattle. Old mobile-home trailer frames and old campers have also been used for eggmobiles. According to Salatin, significant acreage (50 acres) is needed in order to move the birds far enough that they do not return to the previous spot or identify a favorite spot such as a garden. He moves his eggmobile every few days.

Skid housing is generally moved less often than wheeled housing, because it can be hard to drag. If wooden skids are used in organic production, they should not be pressure-treated with copper-chromium arsenate or other prohibited materials. See ATTRA's *Organic Alternatives to Treated Lumber*. Metal pipes are another option and are smoother to drag than wood.

The use of small shelters on skids is described in *Free-Range Poultry Production and Marketing* by Herman Beck-Chenoweth. (12) His shelters have a roof and a wood floor covered with litter but only chicken wire instead of walls. He moves the shelters to fresh pasture every four weeks

A portable shelter with a floor.

to prevent turf damage and maintains at least 100 feet between each house to keep flocks separate. Beck-Chenoweth's system is described on his website *www.free-range-poultry.com*.

This French house is portable. It has no floor but uses litter and has automated feeding equipment.

An attractive free-range house in the U.K.

For many attractive designs for small poultry houses used for free-range production in the United Kingdom see *www.forshamcottagearks.co.uk* Web site.

Andy Lee pioneered the use of electronet for poultry in the U.S., using the term "day-range," in his book *Day Range Poultry*. (13) The use of portable electrified netting as fencing allows bird activity to be placed where desired, reduces predation, and is easy to move. A 165-foot roll of netting encloses an area roughly 40 feet by 40 feet.

The electronet may completely encircle the house, or it can be looped off one section of the house. Temporary fencing makes many configurations of paddocks in conjunction with a mobile house. The electronet should be moved before the grass starts growing into the netting, which will short it out and make it hard to move. Putting the housing in the middle of the enclosure will reduce birds from flying out.

Salatin has an egg production system using net fencing that he calls the "feathernet." Salatin moves his "feathernet" house and netting to a new site every three days, making a figure-eight with two 450-foot circles of netting (using three rolls each), so he can move the housing into a new circle without letting birds escape. See ATTRA's *Poultry: Equipment for Alternative Production* for more information about fencing.

Salatin's "feathernet."

Housing is sometimes designed to remain open at night in order to provide longer hours of outdoor access and eliminate the tasks of opening and closing doors. Birds forage actively at dusk. EU legislation allows a greater indoor stocking density if the house remains open at night. Flaps over the exits can deter predators such as owls from entering the house and help maintain

The use of portable electrified netting as fencing allows bird activity to be placed where desired, reduces predation, and is easy to move.

temperatures in the house, and electronetting deters ground predators.

The housing design may impact portability. Portable houses usually have litter-covered floors to protect birds and keep them off wet ground. Floors increase the structural stability to keep the house from pulling apart when moved. However, houses without floors are less expensive to build and reduce potential habitat for rodents. If a portable house has no floor, it is important to keep rain water from seeping into the house through the ground. A trench above the house on a hillside can divert water flow from heavy rain, or ideally, the house is placed on ground that is higher than the surrounding ground or on a constructed pad of earth.

Pasture pens are set in a pasture, on a lawn, or in a garden. They are a favorite of small-scale producers due to their low cost and flexibility.

A portable hoop house. Photo by Luke Elliott

Colony Production

Colony production is a management system for free-range egg production described by Oregon producer Robert Plamondon (14) on his Web site *www.plamondon.com*. Colony production uses many small houses along with a common nest house and feed area. It is based on a system that was popular in the early 1900s in the California poultry industry centered near Petaluma. It was designed to reduce labor in gathering eggs from small portable houses on range. "Colonies" of small roosting houses share a common nesting house and feed area. Plamondon moves his houses every few weeks to a new spot about 100 feet away. The producer visits only one house, the nest house, to collect eggs. The producer collects the eggs onto flats for pickup by truck or ATV (or, in the past, horse). According to Plamondon, when you have more eggs than you can carry by hand, you need a nest house. Plamondon's roost houses do not use floors or litter, although nesting houses have litter to clean birds' feet. When he moves the house, there is a 2 to 4-inch layer of manure left which he scrapes with his tractor and incorporates into the pasture. The houses should be kept 300 feet from barns, garages, and other places where you don't want birds to roost. He keeps 50 hens in each small house, and his colonies consist of 200 hens each.

Plamondon's colony system has a central nesting house grouped with four small roosting houses.

Pasture Pens

Pasture pens are small floorless pens that are moved daily, usually by hand, to fresh pasture. These inexpensive shelters are set in a pasture, on a lawn, or in a garden. They are a favorite of small-scale producers due to their low cost and flexibility.

Pasture pens were popularized in the U.S. by Joel Salatin of Virginia. Salatin wrote a book called *Pastured Poultry Profits* (15) which described his system to feed, provide care, market, etc. The pens have been so popular with small farmers that Salatin is credited with starting a "pastured poultry" movement in the U.S. He uses a 10-foot by 12-foot by 2-foot wooden pen. The top of the pen is flat, and partially covered by roofing. He stocks at a maximum density of about 1.5 birds per square foot for meat chickens. Producers following his book often have a high rate of success, but moving the pens daily is very labor-intensive.

Pasture Pens. Photo by Pilgrim's Way Farm

Pasture pens are moved daily to fresh pasture.

A pen built from plastic pipe.

No litter is used so birds can forage for grass and the pen is moved daily. The daily moves control coccidiosis, a parasitic disease that occurs if birds are in contact with their own manure. Salatin advises to return to the same plot of land only once per year.

Since the field pen is only a shelter, the birds are usually raised only in warm weather. On rainy days, producers put hay bedding on the ground under the covered section of the pen to help keep birds dry. One producer uses a "sled" under the pen; a good way to get the birds off the ground in rainy weather. The sled is smaller in dimensions than the pen. She lifts up one end of the pen and pushes the sled in. She uses a rectangle frame that is covered with hardware cloth so droppings still fall through to the ground. Although the birds are not free to roam in a pasture pen, they still have the advantages of fresh air and sunlight. However, the confined space of the pen is a welfare concern. Larger pens are needed for turkeys because of their wing spans.

A field pen generally provides good predator control, but some predators (namely raccoons) can grab chickens through the wire. If there are low spots in the pasture, holes between the bottom of the pen and the ground need to be stopped up with scraps of wood or other materials. Some producers run an electric wire around the pen area a few inches off the ground to keep predators away or surround the pens with electronet fencing. Some producers use a combination of field pens and fencing, opening up field pens within a yard enclosed by electronet; the birds range in the entire enclosure during the day.

The pens are moved manually by putting a dolly on one end and lifting by a handle on the other. Birds learn to walk along with the pen as it is dragged across the field, but occasionally a bird will escape or be injured during a move.

The basic pen design can be modified in many ways. Plastic (PVC) pipe and rebar have been used in place of wood to lighten the structure. However, in areas with strong winds, light pens need to be staked down.

Hoophouse pens are popular.

Pasture pens are good for seasonal production, but moving the pens daily is very labor-intensive.

Some producers peak the roof to allow more heat to escape, to keep rainwater from pooling, or to keep goats off. Skids or wheels can be mounted on the pen instead of a dolly to move the pen. The field pen can also be adapted for egg production by adding nestboxes. There are many other field pen designs that are flat, peaked, domed, or hooped. Building materials include wood, PVC, rebar, electrical conduit, and bamboo. Plamondon has a hoop design on his web site that uses cattle panels. See ATTRA's *Range Poultry Housing* for pen designs and construction details.

In Europe, there are some fancy—and expensive—pens. Some have attached housing. These European "ark" houses are available through U.S. distributors, but there are also some similar pens in the U.S. The Henspa (16) and the Eglu (17) are available for urban poultry production.

Poultry species should not be mixed, nor should flocks of different ages comingle.

Urban producers often use small pens with attached houses. Photo by Omlet

A booklet called *Pastured Poultry,* developed by the National Center for Appropriate Technology (NCAT) for Heifer International, is available from ATTRA. It presents case studies from a Heifer project, describing the experiences of 19 producers in the South who each raised a batch of pastured poultry in field pens, and includes sections on mortality, weather, pen construction, economic analysis, and more.

Integrated Systems

Diversified farming is an important part of sustainable agriculture, and poultry can be integrated with livestock, crop, and vegetable production in "permaculture" systems that integrate principles of natural systems with agriculture. Some organic programs require that at least 50 percent of the poultry feed come from the farm where the birds are raised—or a nearby farm—in order to keep the nutrients cycling in the same region. Diversified farms allow nutrients to be recycled between plants and animals.

Sheep can be integrated with free-range poultry and help to control the forage for poultry. Photo by Linda Coffey

Diversified systems focus on services that poultry can provide, such as fertilization, tillage, and insect and weed control rather than only meat production. A permaculture concept called "stacking" combines several enterprises on the same piece of ground. Various species of domestic animals can be raised together to complement each other, creating mutually beneficial relationships.

Disease cycles can be broken when the same species does not occupy the same site all the time. For example, sheep on pasture can clean up parasites that affect poultry. However, poultry species (chicken, turkeys, ducks, etc.) should not be mixed, nor should flocks of different ages comingle. Some species are "carriers" of disease that can affect other species and older birds can also carry disease to younger birds.

Salatin has a hoophouse mainly to overwinter small livestock. Rabbits are kept in hanging cages with chickens on the floor. Worm beds are kept underneath the rabbit cages and are covered with wire to keep chickens out. In the spring, after the

animals are removed, the hoophouse is used for early vegetable production. Salatin uses double layers on the hoophouse—a shade cloth and a clear tarp. The shade cloth can be removed to capture solar energy during winter. Salatin makes his buildings multi-purpose in order to rotate species in them.

Salatin overwinters layers and other small livestock in a hoophouse which in spring is used to start early vegetables.

This "versashelter" or pasture pen is not only used for poultry production; it is also a cold frame for starting vegetables.

Free-range chickens foraging in a forest in France.

Poultry may share pasture with cattle, sheep, and goats. The pasture soil is improved by the poultry's rich manure which helps revive fertility on a farm. Several species of animals may be grazed simultaneously, or the grazing may be staggered to allow only one species at a time in the paddock. Multi-species grazing can aid in protecting poultry from predators that respect large animals. Sheep in particular can help manage the forage for poultry. However, cattle and goats may disturb poultry housing and feed. Cattle may not have experience with poultry netting and may bring it down by accident. Exclude ruminants from poultry feeding areas to prevent foundering from overeating grains. Also, poultry feed may have additives not appropriate for ruminants.

Many cattle producers keep poultry to scratch apart larva-harboring dung pats, which helps reduce fly and parasite problems on the cattle. Joel Salatin has said he would keep layers in his cattle pastures even if there were no eggs—just for the health benefits to the cattle.

Chicken tractor

Some vegetable growers insist that in order to build a sustainable system, livestock or their manure must be incorporated into the farm for fertility.

A "chicken tractor" is a way to integrate poultry production with vegetable production. Andy Lee described his system in a popular book called *Chicken Tractor* (18). Birds are kept in small pens in a garden to provide fertility, tillage, and insect control. Lee uses a small floorless pen so the birds can forage and scratch. The pen is covered with wire and usually has a covered top or a small attached house. The pen is moved daily on fallow beds to add fertility and increase garden yields. The chickens also weed and till the beds and help control insects. Garden wastes are useful feed supplements. In addition to rotating the pen daily to a fresh spot, Lee suggests keeping the pen in one spot and adding fresh straw bedding daily to create a raised garden bed. Moving the pen after one month

Multi-species grazing can aid in protecting poultry from predators that respect large animals.

will leave a sheet-mulch on top of the beds to kill grass and weeds. According to producer Jean Nick, heavy broilers don't really till the soil. "They just poop and stomp on it." Layers are better at clearing weeds and bulbs and scratching the ground.

Poultry in a "chicken tractor" improve garden beds by scratching, insect control, and weed control.

If poultry are kept in areas with growing crops that are certified organic, measures must be taken to ensure that the crop does not become contaminated with droppings to the extent that it presents a food safety hazard.

Scientific studies have examined the impact of poultry on fertility, integrating birds with vegetable and forage production. Jim McNitt, PhD, (19) at Southern University and University of Illinois graduate student Ben Lubchansky (20) have conducted such examinations.

Poultry can also be kept in gardens, fenced with portable electronetting. Chickens help prepare the ground for vegetable planting by tilling. After harvest, birds clean crop residues in market gardens in the fall—turkeys are especially useful for this purpose. According to Andy Lee, "from October through Thanksgiving the turkeys can clean every bit of weeds and spent plants from the garden and leave a rich load of manure behind." "Fold" houses in the United Kingdom allow flocks of chickens to help glean fields after crops are harvested. (21) Chickens are not generally appropriate for a producing garden, because they scratch up seeds or eat crops. According to Vermont producer Walter Jefferies, "I don't let them in early in the season when the seedlings are getting started or late in the year when they'll peck ripe veggies. Chickens, guineas, and ducks all work with some plants such as potatoes, corn, tomatoes at the right states."

Poultry can also be kept in vineyards and orchards. Researchers at Michigan State University (22) studied the use of chickens and geese in apple orchards. Chickens were found to control insect pests while geese aided in weed control. Poultry are kept in some California vineyards. (23) Producers Greg and Jeff Kuntz (24) in Iowa have raised poultry in a multicropping system: a vineyard system with sweet corn and poultry. The brothers use the corn and poultry as a way to add value to the vineyard while the grapes are being established. Young vines are encased in grow tubes that protect them from poultry and that can be removed later. See Bill Mollison's book, *Permaculture: A Designer's Manual* (25) or Alanna Moore's *Backyard Poultry—Naturally* (26) for more poultry permaculture ideas.

Poultry foraging in a vineyard. Photo by Jeff Kuntz

If poultry are kept in areas with growing crops that are certified organic, measures must be taken to ensure that the crop does not become contaminated with droppings to the extent that it presents a food safety hazard. USDA organic standards require that raw (uncomposted) manure be incorporated 120 days before harvest of a crop whose edible portion has contact with the soil (and 90 days for crops without direct contact). While there is an exception for grazing animals, it is still important to take appropriate measures to prevent the presence of manure on crops at harvest time.

Other benefits offered by poultry:

- Some people keep chickens for tick control on their land.

- Turkeys were used in the past for insect control in crops, such as in tobacco during U.S. colonial times. Turkeys are more aggressive foragers than chickens.
- Weeder geese were used on a large scale in California in the 50s to weed cotton fields before the widespread use of herbicides. Geese have a strong preference for young grasses and have been used successfully to weed crops such as strawberries, potatoes, and onions.
- Ducks have been used to control aquatic plants in ponds, especially duckweed and pondweed. Muscovy ducks have been used for fly control on dairy farms. Ducks and geese provide insect, snail, and slug control.
- Guineafowl, considered luxury food in Europe, are good foragers, controlling insects in pastures and gardens. Because of the noisy calls they sound when alarmed, guinea fowl and geese can also act as "watchdogs."
- ATTRA can provide more information on turkeys, geese, weeder geese, ducks, guinea fowl, and gamebirds upon request.

Application of outdoor poultry production to international development work

The production systems described in this publication are useful not only for alternative poultry production in the U.S. and other developed countries, but also for developing countries, where production systems rely heavily on integration with other farm activities. In many villages, poultry are kept loose in order to scavenge food waste.

While large-scale indoor production system is used in many countries around the world, small-scale systems remain important. For example, small-scale growers produce 30 percent of the poultry in China.

Choosing a Production System

A producer's motivations will influence the size and type of production system choosen. Is the plan alternative poultry being a farm centerpiece or a part-time source of supplemental income? Is the plan year-round production or seasonal? Producers may choose one system for layers and another for meat birds.

Choosing a production system involves considerations such as the following:

- **Intensive vs. extensive**: Many large-scale operations use indoor production systems or semi-intensive systems with a yard. However, an extensive system is ideal for free-range poultry, especially combining poultry with other livestock grazing.
- **Fertility implications**: Does the producer want a light layer of manure spread over a large area or a heavy layer of manure over a small area? Is a goal fertility for a pasture? Or feedstock to compost for market garden or crops? Can a producer control excessive nutrients by rotating poultry land with crop production, grazing with ruminants, or making hay?
- **Flexibility**: Many producers start with a pasture pen since it is an inexpensive system and flexible. They can try out one batch to see whether they like raising and processing poultry and whether they can build a market. Although it is labor-intensive, the entry costs for the enterprise are low. Many producers eventually switch to a different production system as their operations grow.
- **Labor and management**: A fixed house is easier to service, while moving portable houses obviously takes time. Ease of access is also an issue in small pens, so many

A producer's motivations will influence the size and type of production system choosen.

producers make pens tall enough to stand in.

- **Bird welfare**: Some consider the pasture pen inhumane because it may expose birds to the elements, and submissive birds have no way to escape aggressive birds in the confining quarters. Active breeds are less able to forage in a pasture pen.

Outdoor Area

Outdoor access or "extensive" production allows poultry to express natural behaviors, provides sunlight and fresh air, and a healthy environment for the birds.

Outdoor access allows poultry to express natural behaviors. Birds scratch, pursue insects, eat forage, and dust-bathe outdoors. Outdoor access provides more space and is called "extensive," which may reduce stress because the birds are less crowded. Direct sunlight, fresh air, and the elements (frosts, heat, drying) can help reduce disease. Outdoor access can enrich the lives of poultry and incorporate their activity as part of biological cycles and nutrient cycles. However, if outdoor access is poorly done, it will be a detriment for the poultry rather than a benefit.

Land should drain well and should be mainly covered with vegetation. Land with low spots may be a problem in heavy rains, and poultry may be exposed to pathogens and parasites if they drink from dirty puddles. However, waterfowl need access to bathing water. For certified organic production, there should be no synthetic chemicals applied to the land for three years. (9)

Avoid low areas where water can puddle.

Comparisons of Free-Range Poultry Production Systems

	Fixed House and Yard	Portable House	Pasture Pen	Integrated Systems
Type	Semi-intensive	Extensive	Extensive	Usually extensive
Fertility	Heavy	Light	Can be heavy in patches	Usually light
Flexibility	Rigid	Flexible	Very flexible	Very flexible
Labor	Can be automated; no moves; litter management needed	Labor intensive; moves frequent or infrequent; litter management needed	Very labor intensive; Daily moves needed; no litter management	Labor intensive
Bird Welfare	Poor to good	Good	Poor to fair	Variable
Seasonality	Year-round	Can be year-round	Seasonal	Generally seasonal; can be year-round in tropics
Comment on use	Popular with large free-range producers; yard should be subdivided for rest	Steady growth	A favorite of beginners	Useful for diversified farms or international development

Birds need the same services outside the house as inside. They should have access to feed and water outside so they do not have to return inside. Feeders should be protected from rain and wildlife with a shield or cover and should be easy to move to a new location. Birds also need access to shade and shelter so they don't run back to the house every time something flies overhead. (2)

Poultry need feeders and waterers in outdoor areas as well as indoor.

The chicken evolved from a ground dwelling forest fowl that inhabited tropical forest clearings and woodland edges and roosted in trees at night. (27) As flightless birds from the jungle, they need protection and shade outdoors, such as trees and bush plantings. In fact, they may not venture outdoors without it. Chickens do not like full sun, strong winds, or overhead predators. European research has shown that birds will forage in the open but prefer a covered area for resting. (1) Some free-range programs in Europe *require* shade/shelter in outdoor areas. Trees and bushes are multipurpose, providing shade, roosts, overhead cover, and a wind break. Man-made constructions can also be used, including roof overhangs, walls, tarps and shade panels, portable "wigwams," and strawbales with pallets on top. Tarps on wheels provide portable shade and keep manure from collecting in concentrated areas. Tall crops such as corn or sunflowers can also be planted to provide shade and additional feed. Sometimes poultry are raised close to corn fields so birds can range among the tall plants.

Shade is crucial in outdoor areas for poultry; wide open fields are not preferred habitat.

Shade can be constructed.

Popholes should be large enough for several birds to exit at a time.

Poultry can be combined with trees in an "agroforestry" setting, such as an orchard or woody ornamentals. A variety of trees, shrubs, understory plants and a pasture clearing will offer a wide range of nutrition, herbs, live protein, and shelter to the birds. Elm Farm Research Centre (28) in the U.K. has planned a poultry agro-forestry system with trees, shrubs, and health-promoting herbs.

Studies of large flocks of free-range meat birds in the U.K. showed that even in summer, the maximum number of birds that came outside the house was only about 15 percent of the flock. The number of birds outside was positively correlated with the amount of tree cover on range, as well as the time of day and season of the year. Specifically, more birds ventured outside if there

was tree cover. Birds were less likely to go outside in the winter or during the middle of the day. Chickens prefer areas with trees, avoid bright sun, and either stay close to the house or seek tree cover. A wide open field is not preferred habitat. (29)

Encouraging birds to forage is important for the authenticity of free-range production and consumer confidence, and it begins with housing design. Keeping the buildings small or providing many exits enables birds to find their way outdoors. Bird-sized doorways may be used. Human doorways or opening an entire side provides additional access. Provide exits that are big enough that birds don't block the door. EU legislation requires 4 meters of pophole for every 100 square meters of house (13 feet of pophole per 1076 square feet). (8) Maintaining vegetation or putting slat flooring by the popholes on the inside and outside helps reduce the amount of mud the birds track inside. Some programs like the Assured Chicken (30) in the U.K. require a doormat.

Chickens prefer areas with trees, avoid bright sun, and either stay close to the house or seek tree cover. A wide open field is not preferred habitat.

Breed also plays a role in encouraging foraging. The fast-growing Cornish cross typically used for meat production in the U.S. is not as active as other breeds, especially as they get older and heavier. Some producers believe fast-growing birds in particular must be encouraged to graze by removing their concentrate feed temporarily. Sometimes fast-growing birds will go outside, but only to rest rather than forage. Slow-growing meat birds and layers are more active and may go outside and forage more. Usually birds return to the house at night due to their roosting instinct but some birds may need to be trained.

Some producers move outdoor feed and water stations away from the house to encourage foraging over a broader area and reduce stocking density near the house. The shade and shelter in the outdoor area will also encourage birds to move away from the house.

Birds go outside mainly in the morning and dusk. In hot weather, they may stay inside in the heat of the day or rest in the shade. Chickens are creatures of habit and use paths. Birds may range a considerable distance from the house depending on the production system and conditions. Active breeds may range about 100 meters (328 feet) from the house. (31) Some producers believe that making forage available from an early age during brooding encourages birds to forage in the future.

Pasture

Chickens obtain limited nutrients from forage plants. Forage can be high in vitamins and protein; however, the nutrients in forage are not packaged well for chickens. Chickens were domesticated from wild, seed-eating jungle fowl, and have short digestive tracts. When chickens eat forage, their ceca develop microbes with the capacity to digest fiber and are much larger than the ceca of chickens that do not eat forage. Still, chickens cannot digest large quantities of fiber like ruminants can. Some other avian species, such as geese, can obtain more nutrients from forage, because they are better able to digest fiber. Poultry obtain high-quality nutrients from live protein such as worms and insects. On pasture, birds may eat enough nutrients to replace 5 to 10 percent of diet; however, when formulating rations, it may be best to assume zero contribution from pasture, because it is difficult to know what nutrients will be supplied and in what amount.

A key to pasture management for poultry is to keep the forage young and vegetative. Older plants are less digestible than young leafy plants. According to one producer, "chickens ignore vegetation over four inches high—all they will do is trample on it." In tall grass, they tend to make tunnels to feeders and not use the rest of the range. Tall grass holds moisture that may harbor parasites. Further, it can wet the birds' feathers and the moisture may be tracked into the house. Tall grass, especially when mowed, may become caught in the crop and cause digestive problems. (1,2) Poultry yards should be laid out so it is easy to use a tractor to mow, plow, and plant. Ruminant grazing can help manage forage for poultry

and avoid the need to mow or hay. In fact, combining sheep with poultry production is a best management practice to manage the pasture. (1,2)

Pasture for free-range poultry is usually designed to be hard-wearing or is designed for ruminants. Many variables come into play in determining the "best forage" for your operation: soil type, pH, amount of rainfall, field fertility, type of tillage for seeding, size of pasture, and other planned uses of pasture, such as ruminant grazing or haying. Contact your local Extension service to discuss the best mix of cool season and warm season forages for your region. You may not need to add fertilizer because the poultry will add it in the form of manure, improving the pasture.

A perennial pasture with legumes and grasses is often suggested for ruminant pasture, because diverse species are the most reliable for a wide range of conditions, from high moisture in spring and fall to hot, dry days in summer. It may require a few years of intensive management by ruminant grazing to develop diverse pasture.

In the early part of the 1900s, scientific research examined forages and pasture management for poultry. Much of this research is still useful today; however, the modern broiler grows much faster than the meat birds of 100 years ago and needs more nutrients and feed supplementation. According to Plamondon, "Everything I've read points to oats as the ideal cool-season green feed, while ladino clover, alfalfa, and to a lesser extent other clovers are better summer feeds. My own experience with oats has been very favorable. Oats seem to do very well when broadcast by hand" (32). According to Plamondon, the research showed that ladino clover and alfalfa remained palatable throughout the summer if mowed occasionally. (33)

Legumes in the pasture may increase the omega-3 fatty acids in poultry meat and eggs. Chloroplast membranes of plants, where photosynthesis occurs, contain unsaturated fatty acids. The leafier the plant, the more omega-3 fatty acids it has. Clover, for example, is leafier than alfalfa, which has more stem. Research at Pennsylvania State University (34) compared the amount of unsaturated fatty acids in three types of pasture: 1) alfalfa and grass, 2) red clover and white clover and grass, and 3) mixed grass. They found legumes had more unsaturated fatty acids. Eggs from hens raised on legumes and grass had more omega-3 fatty acids and vitamins than eggs from hens only raised on grass. Poultry can also be run on leguminous cover crops that are planted to increase nitrogen in the soil for crop production. Ruminant access to lush leguminous pasture should be restricted, especially in the spring, because they may overeat and founder (produce too much gas in the rumen).

Special pastures may be designed for poultry, including seed mixes for poultry/sheep pasture. Peaceful Valley Farm Supply (35) offers an Omega-3 Chicken Forage Blend seed mix. There is also interest in herbs that could be beneficial for poultry health maintenance or that could improve meat quality in terms of nutrient content or flavor.

Special pastures may be designed for poultry, including seed mixes for poultry/sheep pasture.

Some plants may be poisonous to poultry, including the following: castor bean (*Ricinus communis*), corn cockle (*Argrostemma githago*), daubentonia (*Daubentonia longifoli*), death camas (*Zygadenus* spp.), glottidium (*Glottidium vesicarium*), milkweed (*Asclepias* spp), nightshade (*Solanum nigrum*), oleander (*Nerium oleander*), pokeberry (*Phytolacca americana*), potato (*Solanum tuberosum*), vetch (*Vicia* spp.), and yew (*Taxus* spp.) (36).

Fire ants on pasture can be a concern when using pastured pens in hot climates. Care should be taken not to place young birds on fire ant mounds. However, older birds may actually eat the ants and destroy mounds. ATTRA has a publication on sustainable fire ant control.

Major parts of the western U.S. are dryland where it is difficult to keep forage in a vegetative state. Drought-tolerant plants, such as perennial and annual ryegrass, sudan grass, millet, and sorghum, can stay

green during the long dry summers, but poultry may not like them as much as other forages. Much western pasture is essentially standing hay and offers little nutrients for poultry; however, live protein and other benefits of outdoor access are still important. In fact, turkeys are native to dry areas of southern North America. Low moisture on dryland reduces the danger of poultry disease and parasites, and the fertility brought by poultry is welcome. Some producers in the West raise birds on irrigated pasture.

Dryland pasture.

Where excessive nutrients build up in the soil, pathogens are also likely to build up as well, resulting in "fowl sick" land.

Pasture Rotation

Rotation allows pasture to recover from grazing and reduces the buildup of excessive nutrients and pathogens. To rotate pasture, birds are moved to new pasture by moving the house or moving the birds to a new yard. Pasture should be rotated at least every two to three months, although every month is better. Pasture can be rotated after flocks of meat birds are harvested, but a layer flock should not remain in the same pasture for the entire life of the flock. The pasture must be rotated.

Mobile houses that can be moved frequently are ideal to facilitate pasture rotation. Moving portable housing creates new environments for flocks, and birds may try to return to the old location if the house is not moved far enough. If a fixed house is used, subdivide the yards into at least 4 separate yards and rotate flocks among these. Plant trees or shrubs about 30 to 60-feet away draw birds from the house. (2)

Free-range poultry production should not add excessive nutrients to the ground. Soil samples taken as an initial baseline and annually will monitor how much nitrogen and phosphorus is added by outdoor access or application of litter to the ground. Legislation is increasing concerning the level of nutrients that can be applied to the land from animal waste. Regulations in the U.S. vary by state. The EU does not allow more than 170 kg/N/ha/year to be added to land from livestock manure, which would be the equivalent of 580 table chickens or the equivalent of 230 hens. (1,2)

Where excessive nutrients build up in the soil, pathogens are also likely to build up as well, resulting in "fowl sick" land. Although many pathogens and parasites will die after their poultry hosts are removed, some are able to survive for a long period of time and re-infect birds when they are returned to the land.

An additional consequence of not rotating pasture is that the vegetation is worn down to dirt. Mud from bare lots is tracked into the house and dirties eggs, greatly increasing egg cleaning costs and increasing moisture in the litter.

Not rotating free-range yards will be a limiting factor on performance due to pathogens. If you have less than 50 birds, you probably do not need to rotate pasture.

In the past, cultivation of crops or hay were rotated into poultry production to use up the nutrients and keep the soil from becoming compacted. According to Plamondon, "The old-fashioned method is to lime the pasture like mad, plow it, and replant it." (37)

The Soil Association recommends that pastures for laying flocks be rested for 12 months between flocks, with a requirement of at least 9 months rest. For meat chickens, the Soil Association makes the following distinctions:

- *Clean pasture*: no poultry for three years or new pasture after crops
- *Relatively safe pasture*: no poultry for one year; or no poultry for six

months if land has been plowed and reseeded

- *Dangerous pasture*: pasture that has had poultry within six months. (1)

Many producers permit outdoor access to improve not only bird welfare but also health; however, there are concerns about birds getting diseases from wildlife. In times of extreme heightened biosecurity, birds may be temporarily confined. At the time of this writing, avian influenza is a concern, and in Europe, many free-range flocks have been confined to prevent contact with wild birds. Take measures to reduce direct contact between domestic poultry and wildlife. Keep wild birds out of range feeders so they won't eat from them or defecate in them. The Soil Association suggests a container with small slits that allows poultry to pick out only a few grains or pellets at a time. Netting over range areas reduces contact with wildlife, and covered areas can eliminate contact. Biosecurity for the Birds (38) is a USDA project that provides information for small poultry producers on how to maintain good biosecurity.

Subdividing the yard of a fixed house permits pasture rotation and rest. The use of bird netting on top can reduce contact with wild birds.

Seasonal aspects of alternative poultry production systems

When poultry have outdoor access, there are seasonal aspects to production. The pasture composition in particular varies, and in the spring, forage grows quickly. The day length and light intensity varies in temperate areas and is more constant in tropical areas.

The U.S. has some regions that are very cold in winter. It is difficult to move portable housing in the winter in areas with snow or to insert electronet fencing poles in frozen ground. Any program that requires outdoor access should specify how birds can be handled in winter and still be considered free-range. In the USDA organic program, birds can be temporarily confined due to inclement weather.

Baled hay, such as alfalfa, and sprouted grains are useful during winter to maintain an intense yellow color in egg yolks and provide enrichment for the birds. Verandas or "winter gardens" are also useful.

In winter, some houses may not be heated. In insulated houses, body warmth may be sufficient to keep the house from freezing if there are enough birds. See ATTRA's *Poultry: Equipment* for *Alternative Production* for information on heating waterers. However, the welfare of the bird should be considered and avoid large temperature swings and cold, wet conditions. Many layers will go outside in snow, particularly if the snow has been packed down. Temperature has an impact on performance, particularly feed intake. Birds tend to eat less in hot weather and more in cold weather, when they need more energy to stay warm.

Predator Control

Predators can cause a lot of damage to a flock and can also spread disease. A solid house is a good defense against predators when the birds are closed in at night. Most predators are nocturnal such as raccoon, opossum, weasel, and owls. Small flocks can be counted to monitor predation, but a producer must be able to recognize signs of predation in large flocks.

Identifying the predator affecting your flock is essential to control. Use the following guide. Welp Hatchery (39) also has information on predator diagnosis on its web site.

For daytime predators, such as dogs, an electronet fence around the poultry yard provides good protection from ground

Predators can cause a lot of damage to a flock and can also spread disease.

Signs	Predator
Several birds killed	
Birds mauled not eaten	Dog
Small bites on body; neatly piled; some heads eaten	Mink or Weasel
Chicks killed; abdomen eaten; lingering smell	Skunk
Only 1-2 birds killed	
Birds mauled; abdomen eaten	Opossum
Deep marks on head and neck; some meat eaten	Owl
Only 1 bird gone; feathers remain	Fox or coyote
Adapted from Berry, J. 1999. (40)	

predators. Other predator controls include moving the house frequently to keep predators off guard, keeping housing away from wooded areas, keeping the housing close to a residence, grazing birds with cattle or other large animals, and grazing on short-grass pasture, which predators do not like to cross in the daytime, Dispose of dead birds properly to avoid attracting predators.

Reliable control for aerial predators such as hawks and other daytime raptors is difficult. In addition, birds of prey are protected by federal law from harassment or shooting. Some producers have a lot of hawk pressure and lose several birds per day to hawks; others lose only a few per year.

Trees, tall crops, roof or window overhangs provide shelter so birds can run for cover. Use wide popholes so birds can quickly enter the house. Heavy broilers may not be as fast at escaping as more active breeds. Overhead bird netting excludes hawks, but this may be impractical for mobile production systems.

Producers use scare tactics and alarms such as a fake owl or hanging reflective ribbons or CDs to reflect light. Scarecrows should be mobile and realistic with changes of clothing. One producer suggested rigging a radio to a motion detector light. According to another, "Here the guineas alert the dogs and the dogs alert us who get the gun." (41) One producer, having trouble with bears, hooked up a car alarm to a battery and put it on the poultry pen. It said "Step away from the car" and started sounding an alarm.

Since hawks are stealth hunters, interference slows them down and gives poultry a chance to escape. One producer uses long rectangular yards, because they are too narrow for hawks to glide in from the sides. Flight is disrupted on the shorter ends of the yard, with poles with surveyer's ribbon. Other producers string fishing line over the paddocks above head height and spaced several feet apart.

North America has some substantial predators, and guard animals can help. Dogs can be trained to guard poultry. Llamas and donkeys also make good guardian animals, especially since they can eat forage and stay with the poultry at all times. Often dogs come to the house to visit or sleep at night.

According to Vermont producer Walter Jefferies, "At issue is how many protectors are in the guardian pack. A single dog or llama, doesn't cut it with serious predation—several are much better as they can work as teams. A pair or pack of guardian dogs will successfully protect against almost anything short of the marine corps. Two do a bear. Three a cougar...Dogs alert us to threats, mark territory in ways that predators understand and respect...By their nature dogs are hunters at the same time of day that predators are at their greatest threat since the dogs are semi-nocturnal. Dogs are also useful for disposal of proteins (slaughter remnants) that I don't want to feedback to our various flocks (pigs,

Guard dogs can protect poultry. Photo by Good Earth Organic Farm

sheep, poultry). Likewise, dogs kill and eat the local pest and small predator populations from mice on up as high as the coyotes foolish enough to enter the pastures."

Some producers live trap predators and may then kill the animal humanely. Problem animals can be relocated, but they may become a problem for another producer. The following web site sells humane traps *www.pestproducts.com/humane_live_traps.htm*.

A live trap.

The Wildlife Services of the USDA Animal and Plant Health Inspection Service (APHIS) (*www.aphis.usda.gov/ws/*) is a resource for predation problems. State wildlife contacts are located at *www.aphis.usda.gov/ws/statereportindex.html*.

Conclusions

Alternative poultry production is growing, including free-range production. Free-range poultry allows poultry to express natural behaviors and provides sunlight, fresh air, and exposure to the elements which can create a healthy, low-stress environment. Many consumers are interested in buying products from birds raised in these systems.

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Table 1. Comparison of requirements of U.S. and E.U. free-range programs for poultry meat and eggs.

	Breed specification/minimum age at slaughter	Feed specification	Max. stocking density: Indoor Birds per m^2	Building size/ popholes	Farm/ flock size	Outdoor area (m^2 per bird)
U.S. free-range eggs and meat	Outdoor access required but no specific definitions					
E.U. free-range eggs			9 hens m^2 with 250 cm^2 litter		2500 hens/ha	4 m^2 per hen
E.U. Free-range meat	Chicken: 56 days Turkey 70 days	70% cereal at finishing	13 birds (max of 27 kg, 59.5 lbs total liveweight)	4m per 100m^2		1m^2 per chicken 4 m^2 per turkey; outdoor access for ½ lifespan
E.U. Traditional Free-range (Label Rouge)	Slow-growing strains; chicken 81 days Turkey 140 days	70% cereal at finishing	12 chickens/m^2 (max of 25 kg liveweight)* 6.25 turkeys/m^2 (max of 35 kg liveweight)	4,800 chickens per house max	1600m^2 per farm site, max	2m^2 per chicken, outdoor access after 6 weeks; 6m^2 per turkey, outdoor access after 8 weeks

A square meter is equal to 10.8 ft^2
*If mobile housing is used in which the popholes remain open at night, the indoor stocking density can be increased: 20 birds/m^2 (maximum of 40 kg liveweight). This type of housing must not be larger than 150m^2.
** If mobile housing is used in which the popholes remain open at night, the indoor stocking density can be increased: 16 birds/m^2 (maximum of 30 kg liveweight). This type of housing must not be larger than 150m^2.
***If mobile housing is used, only 2.5 m^2 per chicken is required

Appendix 1: Recommendation/Requirements for Poultry Production

The USDA does not have specific requirements for free-range.

EU Free-Range Eggs

- Outdoor access, with the housing described in "Barn" production. (Barn production is cage-free and limits maximum stocking density to 9 birds m^2 (1.2 ft^2 per hen), and requires that each hen have at least 250cm^2 (38.8 in^2) of litter area.)
- Maximum stocking density for outdoor area: 1 hen/4m^2 (1 hen/43 ft^2)
- (Equivalent to 2,500 hens/hectare or 1000 hens/acre)

EU Free-Range Poultry Meat

- Finishing feed must at least 70% cereal (low protein)
- Minimum age at slaughter: chickens must be 56 days of age or older; turkeys must be 70 days or older
- Maximum stocking density for indoor area: 13 chickens per 10.8 ft^2 (with a maximum of 59.5 lbs of total liveweight) (0.83 ft^2 per chicken or 5.5 lbs per ft^2).
- 4m of pophole for every 100m^2 of house (13 ft of pophole per 1076 ft^2)
- Outdoor area mainly covered by vegetation
- Birds must have outdoor access for at least half of their lifetime
- Maximum stocking density for outdoor area: 1 chicken per 10.8 ft^2 or 1 turkey per 43.2 ft^2
- (Equivalent to 4033 chickens per acre)

EU Traditional Free-Range Poultry Meat (identical to French Label Rouge requirements.)

- Strains: only slow-growing
- Minimum age at slaughter: chickens must be 81 days or older; turkeys must be 140 days or older)
- Finishing feed must be at least 70% cereal
- Maximum stocking density for indoor area: 12 chickens per 10.8 ft^2 (with a maximum of 55 lbs of total liveweight) (0.9 ft^2 per chicken or 5.1 lbs per ft^2); 6.25 turkeys per 10.8 ft^2 (1.7 ft^2 per turkey) (up to 7 weeks of age) with a maximum of 77.2 lbs liveweight (7.2 lbs per ft^2).
- Maximum stocking density can be increased to 20 chickens per 10.8 ft^2 (with a maximum of 88.2 lbs of liveweight) if doors are left open at night. The mobile house must not be larger than 1614.6 ft^2.
- 4m of pophole for every 100m^2 of house (13 ft of pophole per 1076 ft^2)
- Flock size (site): 17,222 ft^2 of poultry houses at a single site. This limits the number of chickens on one farm to 17,600 birds.
- Flock size (house): Each house can't have more than 4,800 chickens
- Chickens must have outdoor access after 6 weeks; turkeys after 8 weeks.
- Maximum stocking density for outdoor area: 21.6 ft^2 per chicken and 64 ft^2 per turkey
- (Equivalent to 2026 chicken per acre)
- In addition, the term "total freedom" can be used if outdoor access is unlimited and there are no fences.
- Pasture rest or rotation: Label Rouge requires a rest of 8 weeks for pasture. This is achieved by a 2 week down time and 6 weeks in brooding.

All these standards also have stocking densities for ducks, geese, guineafowl that are not listed here.

Alternative Poultry Production Systems and Outdoor Access
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