



Technical Guidance on Poultry Raising



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Chapter I Scientific Construction of a Chicken House

Section 1. Site selection of a chicken farm

1. Scientific planning and design of a chicken farm

The scientific planning and design of a chicken farm is an important guarantee for healthy and successful production. The planning and design of a chicken farm should meet the requirements of chicken hygiene and epidemic prevention, reduce construction cost, facilitate production management, and improve labor productivity and economic returns.

The design should consider the funding, the breeding scale, the environmental carrying capacity, and biosecurity issues. The farm area should be rationally arranged to meet the requirements of production technology and biosafety. The construction should meet the needs of healthy production. These facilities not only need to meet the requirements of feeding and management, but also the challenges of seasonal changes and natural disasters. A long-term plan needs to be covered in the design process, and there should be room left for future development.

2. Site selection of a chicken farm

2.1 Terrain selection

Choose high, dry, flat, sunny, windward and well-drained terrain. This kind of terrain has the advantages of warmth, lighting, ventilation and

dryness, which are conducive to reducing construction difficulty and engineering cost.

2.2 Ensure unimpeded communication, electricity, water, and roads.

Ensure adequate water supply, mainly tap water. Water supply facilities shall conform to relevant provisions, and it is better to adopt a water supply system that is combined with production, living and fire control. Ensure that the water quality is good and the drinking water quality standards are met.

There had better be convenient transportation and flat road that is close to the feed base. Enough power supply and generator sets are also necessary to prevent the production from being affected by power outage.

Sites that had severe outbreaks, old chicken farms, and new or expanded farms built on contaminated soil should be excluded.



Figure 1-1 Terrain selection of a chicken house



Figure 1-2 Convenient transportation

2.3 Location and transportation

The chicken farm is generally required to be more than 3 km away from the residential areas and 5 km other poultry farms. There should be no polluting factories and all kinds of livestock farms, slaughterhouses, livestock processing plants and livestock trading markets. The transportation of production materials shall be convenient, with a distance no more than 1 km away from the railway main line and 500 m the highway main lines.



Figure 1-3 Location of a chicken farm

2.4 Climate conditions

Climatic conditions mainly refer to the local annual rainfall, accumulation temperature, maximum and minimum temperature, dominant wind direction, maximum wind, sunshine duration, sunshine intensity, etc. These conditions are related to the layout of the building, the chicken house orientation, the type, etc.

Section 2. The layout of a chicken farm

Based on the environmental conditions of the proposed site, the construction quantity and relative location of various buildings are determined. The design has reserved space for the future expansion of the farm.

The chicken farm needs to be built scientifically and reasonably according to the production technology and biosafety. The requirements of production process should be met to ensure the smooth production and implementation of technical measures. The common production technology of a chicken farm is seen in Figure 1-4.

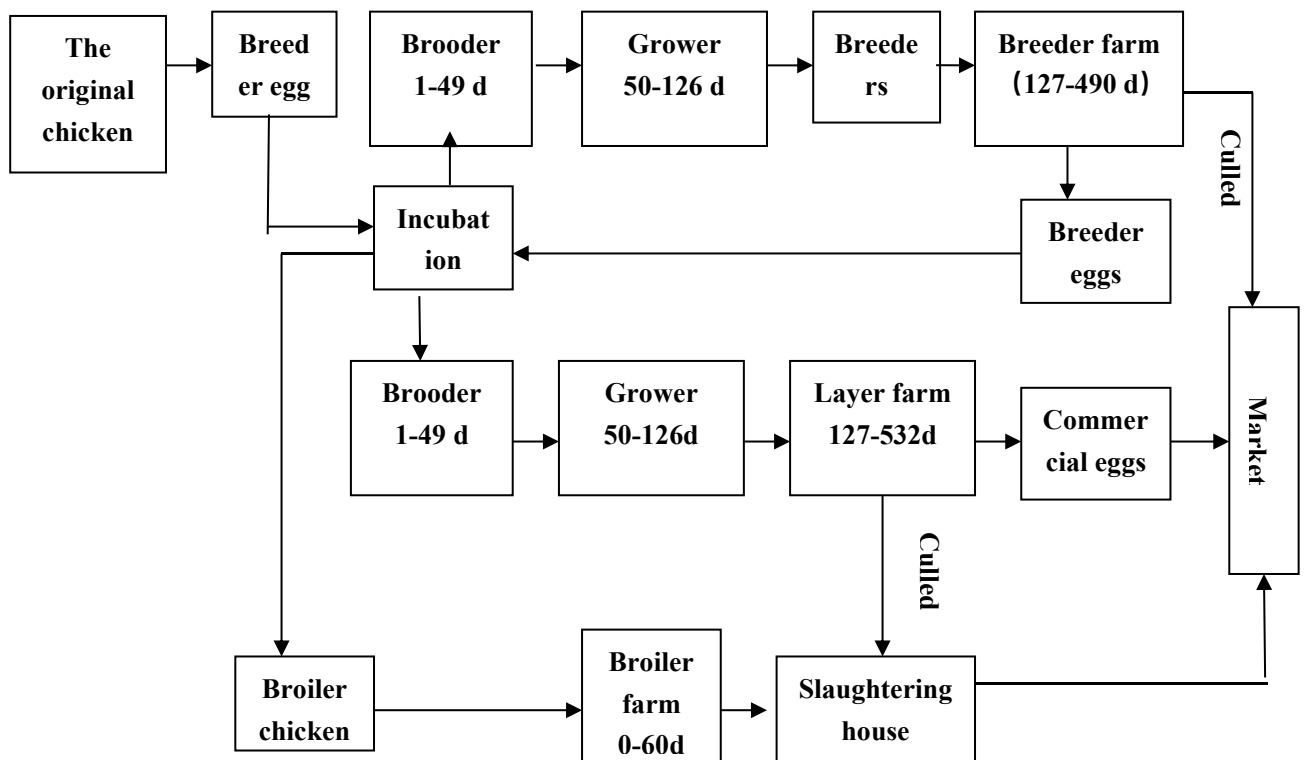


Figure 1-4 Common production technology of chicken farms

The dominant wind direction, terrain, building type and number should be taken into consideration, and efforts should be made to make it reasonable, clean and efficient.

Whether the layout is reasonable is related to the microclimate of the site, the lighting and ventilation of the chicken house, the production efficiency and other issues.

The chicken farm area is mainly divided into living area, production area and isolation area, generally in order of the direction of the prevailing wind in the district.

The living area, with a front door and a disinfecting pool, should be in the prevailing wind direction and at a higher terrain. Besides, it should be walled off from the production area.

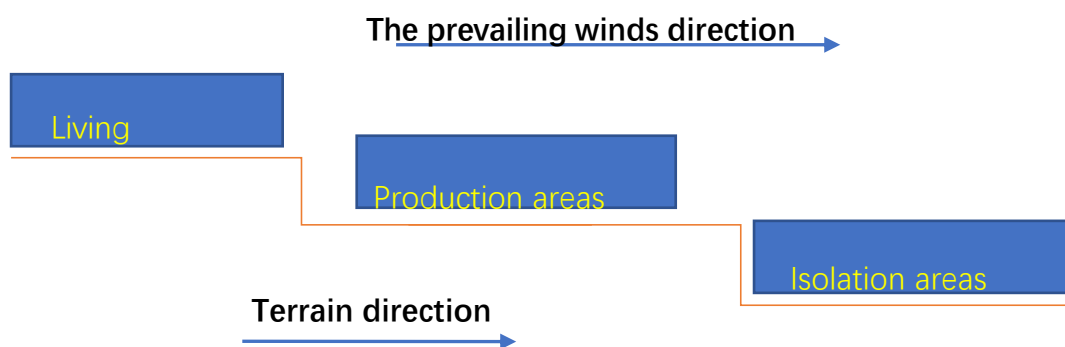


Figure 1-5 The layout of different areas

The living area is equipped with administrative office, communication room, disinfection room, epidemic prevention room, debris storage, staff dormitory, etc.

The door, the disinfecting pool and the disinfecting room should be set

between the living area and production area.



Figure 1-6 Disinfecting pool at the main entrance



Figure 1-7 Disinfecting room between the living area and production area

Set up separation walls or separate green belts between different areas.

The production area includes brooder house, grower house, layer house, feed and egg warehouses, veterinary room, etc., arranged from top to bottom according to the wind direction. Feed inlets and egg traders are located outside the production area.

The isolation area includes isolation room and veterinary room, generally located downwind of the whole area, and the distance between the other two areas is no less than 50 m.

The personnel, vehicles, equipment and tools used in each area should be strictly controlled so as to prevent cross-visits.

Chicken houses should be arranged as neatly and parallelly as possible, see the renderings in Figure 1-8, Figure 1-9.



Figure 1-8 Layout of a layer farm in Yuzhou



Figure 1-9 Layout of a chicken farm

Some large companies have planned and designed their farms as seen in Figure 1-10, Figure 1-11.



Figure 1-10 Layout of a chicken farm in Xishan

The orientation of a chicken house mainly considers the influence of sunlight and ventilation.

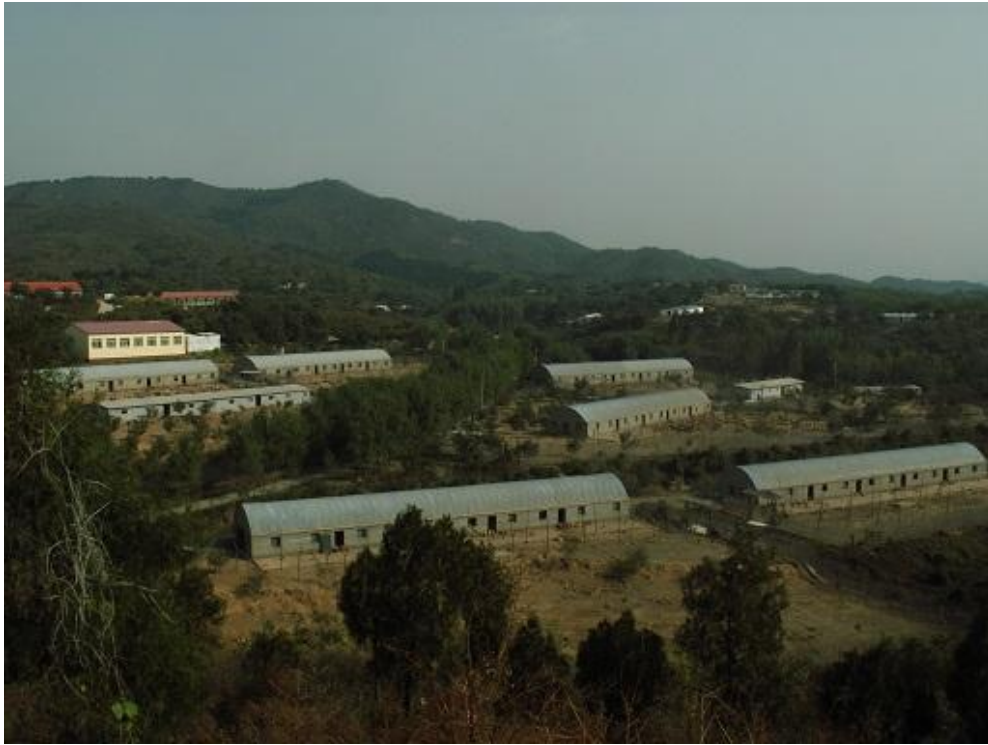


Figure 1-11 Layout of a chicken farm in Miyun



Figure 1-12 Layout of a chicken farm



Figure 1-12 Layout of a chicken farm

In the cold areas, the vertical wall of the chicken house is required to be at an angle of 30-45° to the main wind direction in summer, so that the cold wind in winter penetrate small; in the hot areas, the vertical wall of the chicken house is perpendicular to the main wind direction in summer, which is conducive to ventilation and cooling.

The orientation of chicken houses varies from region to region, but mostly 15-45° north to south.

To determine the spacing, mainly the sunshine, the ventilation, the epidemic prevention, the fire prevention and the saving areas will be considered. Under normal circumstances, the space between the chicken houses is 3 to 5 times the average eaves of two houses.



Figure 1-13 Space between the chicken houses

Public health facilities mainly include roads, protective facilities, septic tanks, greening projects, etc. Roads in the production area shall be divided into clean roads and dirty roads. Clean roads are mainly used by feeding managers to transport feed and fresh eggs, which are generally located in the center of the farm and lead to one end of the chicken house; Dirty roads are mainly used for transporting chicken manure, culled chickens, etc., which can lead from the other end of the chicken house to the outside of the farm; Clean roads and dirty roads should not cross as far as possible to avoid pollution.

The road, with a slope of 1%-3% on both sides, should be impervious to water. The width of the road that connects to the off-site should be 3.5-7 m, and the width of the road for agricultural vehicles such as small cars should be 1.5-5 m.

High walls or deep trenches should be built around the chicken farm to

prevent off-site personnel and animals from entering the farm area.



Figure 1-18

Manure tanks are temporary storage places for manure. They should be located downwind of the production area, and be at least 100 m away from the chicken house for ease of transportation.



Figure 1-19 Temporary storage of manure

Greening projects include road greening, sunshade greening and site

greening. Hedges such as cypress and holly can be planted on both sides of the road; 1-2 rows of shrubs with neat crowns are generally planted outside of the road. Shade greening is generally set on the south and west side of the chicken house, or around and in the center of the sports ground. Choose deciduous trees with high trunks and large crowns.



Figure 1-20

Site greening refers to greening the bare ground in the chicken farm and planting trees, flowers, grass and other plants with feeding value or economic value, such as lawn, fruit trees, etc.

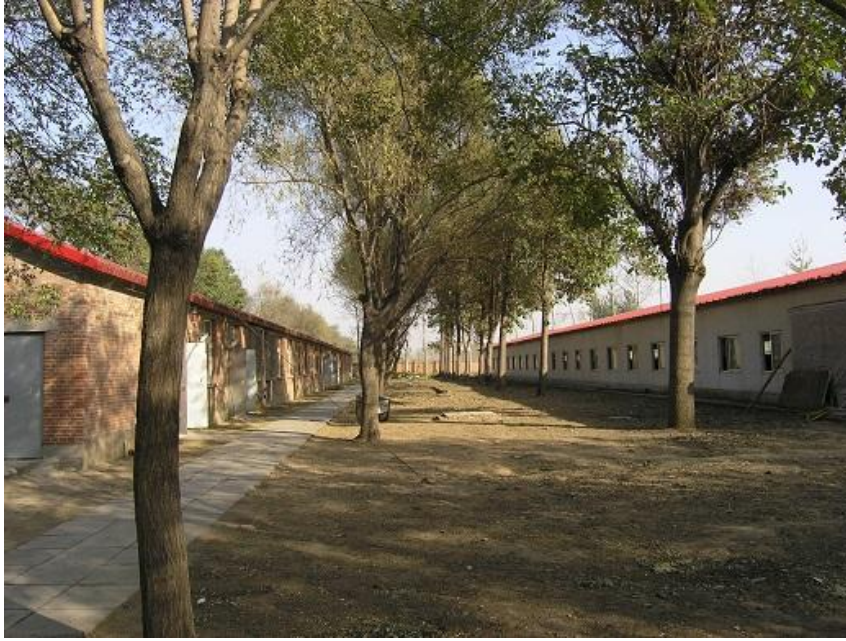


Figure 1-21 Site greening

Section 3. The construction of a chicken house

1. Building design

The building design should meet both the functional requirements of the building and the requirements of production process. It should be able to facilitate the implementation and application of various technical measures, such as the correct selection and application of construction materials, etc. It should be economic and practical. The design should use local materials and be able to save manpower and construction materials, and reduce energy consumption and cost as far as possible. It should be in line with the overall planning and the architectural aesthetic requirements.

2. The requirements of chicken buildings

The chicken building should meet the needs of human operation space and chicken living space, such as the size of human beings, the space range required by human activities and the size and space of the chicken. Necessary space should also be reserved for the devices according to their size. Chicken building areas and some parameters are seen in Table 1-1, Table 1-2, Table 1-3, Table 1-4, Table 1-5.

Table 1-1 Chicken building areas and some parameters

Item	Parameters			
Layers	Construction (m ² /hen)	area	Light type	Heavy type
	Floor raising		0.12-0.23	0.14-0.24
	Caged		0.02-0.07	0.03-0.09

Broiler chickens and grower females	Length of feeding trough (mm/hen)	75	100		
	Length of drinking trough (mm/hen)	19	25		
	Egg-laying box (hen/pc)	4-5	4-5		
	Construction area (m ² /hen)	0-4 weeks	4-10 weeks	10-20 weeks	
	Open type house	0.05	0.08	0.19	
	Enclosed house	0.05	0.07	0.12	
	Length of feeding trough (mm/hen)	25	50	100	
Length of drinking trough (mm/hen)	5	10	25		

Table 1-2 Feeding width of various chickens

Chicken category and age	Feeding width (cm/hen)
Laying hens: 1~4 weeks old	2.5
5~10 weeks old	5
11~20 weeks old	7.5~10
20 weeks of age or older	12~14
Egg-laying hens	15
Broilers: 0~3 weeks old	3
4~8 weeks old	8
9~16 weeks old	12
17~22 weeks old	15

Table 1-3 Vertical aisle width of chicken house

Item	Tools and operating characteristics	Width (m)
Raising system, manure	Feeding with special carts	Cage system 0.8~0.9
Cleaning and management	and egg picking with general vehicles	Floor raising 1.0~1.2

Table 1-4 Microclimate parameters of chicken house

Age, type	Temperature°C	Relative humidity (%)	Allowable noise intensity (dB)	Allowable dust content mg/m ³	Permissible concentration of harmful gases

					CO ₂	NH ₃ ml/m ³	SO ₂ ml/m ³
Adult Chicken house: cage	20-18	60-70	90	2 -5	0.20	13	3
Floor Raising Chicken house 1	12-16	60-70	90	2-5	0.20	13	3
~ 30 days old, caged	31-20	60-70	90	2 -5	0.20	13	3
Floor raising 31 ~ 60 days	31-24	60-70	90	2 -5	0.20	13	3

Table 1-5 Ventilation parameters of chicken house

Type, weeks of age	Air exchange volume (m ³ /h*kg)		Air velocity (m/s)	
	Winter	Summer	Transition period	
Adults: layer house, cage	0.70	4.0	0.3-0.6	
Adults: Broiler house, ground level	0.75	5.0	0.3-0.6	
Layers: 1-9 weeks old	1.00	5.0	0.2-0.5	
10-20 weeks of age	0.75	5.0	0.2-0.5	
Broiler house: 1-9 weeks old	1.00	5.5	0.2-0.5	
10-26 weeks of age	0.70	5.5	0.2-0.5	

3. Building type

Enclosed houses, also called windowless houses, are suitable for cold areas. The advantages include good thermal insulation and light control, and the use of ventilation equipment and artificial lighting. However, the

production costs are high.



Figure 1-22

Semi-open houses are suitable for areas requiring insulation in winter and summer, which use doors and windows to strengthen air convection and use natural light to meet partial lighting requirements.



Figure 1-23

The open type house, of which the walls are partially or completely open, is suitable for hot areas. The open area can be pasted with plastic

films or rolling curtains to keep out wind and rain.



Figure 1-23



Figure Hainan chicken farm



Figure Hainan layer farm

Semi-open houses are also suitable for free range system. The birds can go outside for range, and go back to the house for resting.



Figure 1-30 Semi open house for free range



Figure 1-31 The birds range outside the house at daytime



Figure 1-32 Chickens range outside the house at daytime



Figure 1-33 Small chicken house for free range layers

4. Building structure

Common structures include brick wall bearing, steel and wooden roof frame or reinforced concrete roof frame. Brick arch structure and reinforced concrete portal steel frame can be used. There need to be strong and durable walls.

In addition to meeting the thermal insulation requirements, the thickness of the brick wall needs to have sufficient strength.



Figure 1-34



Figure 1-35



Figure 1-36

The building should have good heat insulation and heat preservation ability. If light bricks such as hollow brick and porous brick, or filled wall are used, the wall thickness can be up to 37 cm, the heat insulation effect can be achieved. The inner surface of the wall is flat, smooth and easy to clean and disinfect. The outside of the wall is coated with cement. Walls can be equipped with wet curtains and fan systems.



Figure 1-37 The chicken house with wet curtains and fan system

The roof is required to be waterproof, heat-preserved, load-bearing,

durable, fire-resistant and lightweight.

In order to enhance the heat insulation performance, the insulation layer is often set between the canopy and the roof. Glass wool and polystyrene foam can be filled in the compartment.

The roof may adopt concrete slab, which is not only good in thermal insulation performance, but also convenient for construction.



Figure 1-38 The chicken house with natural ventilation

The ground is required to be solid, level off and flexible, can have heat preservation to prevent slipping, facilitate clean disinfection. The concrete floor should be flat. Furthermore, it should be 30 cm higher than the outside of the house, with a slope of 1-3%.



Figure 1-37 The chicken house

The underground part of the wall is the foundation. The depth is 70-100 cm and the width 15-20 cm.



Figure 1-38 The foundation of a chicken house



Figure 1-39 The construction of a chicken house



Figure 1-40 The construction site of a chicken house

5. Chicken house size

The size of a chicken house should be determined according to the feeding scale, the feeding mode and the stocking density. Generally, it depends on the span of the house and the degree of mechanization of

management.

At the floor area, the ratio of the brooder house, the grower house to the layer house is generally 1:2:3.

The length of the chicken house should consider the level of mechanization and equipment quality. The length generally should not exceed 100 m, but it can be added when the mechanization level and the equipment quality are better.

The span is determined according to the number of rows in the house and the width of the aisles. The span of open type house should not be too large, otherwise it will affect the ventilation and lighting of the house.



Figure 1-41



Figure 1-42

The height of the chicken house depends on the design of natural lighting and ventilation, the local climate, the requirements of cold and heat protection and the span of the chicken house.

In cold areas, the height of 2.2-2.7m, over 9.0m chicken house span can be appropriately increased. In hot areas with good ventilation, chicken houses should not be too low. Generally, 2.7-3.3m is appropriate.



Figure 1-43



Figure 1-44



Figure 1-45 The brooder house in a farm

6. Inner setting

The aisles in the house include feeding aisle, manure removal aisle and side aisle. Feeding aisle and manure removal aisle are generally arranged in parallel along the house and should not be mixed.

The width of the aisles depends on the span of the chicken house. When the span is greater than 9 m, the width of the middle aisle is 1.5-1.8 m, and the width of the single aisle is 1-1.2 m.



Figure 1-46



Figure 1-47

For the chicken house with windows, the ratio of the window to the ground area is 1:12, the area of the rear window should be about two-thirds of the area of the front window, and the window spacing should be equal. For the windowless chicken house, there are usually only emergency window and entrance ventilation.

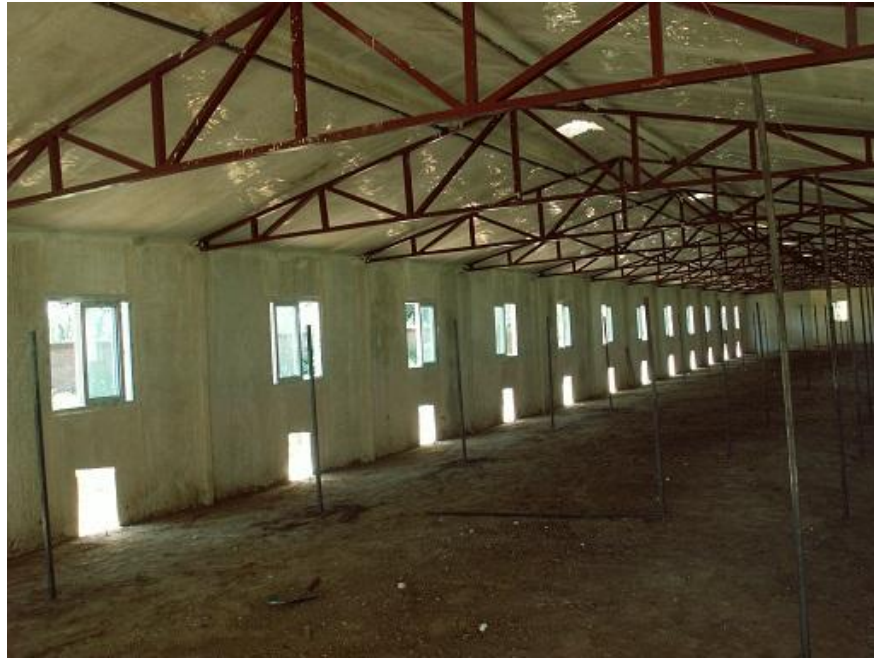


Figure 1-48

The size of the doors depends on the type and use. The door exclusively for personnel entry is generally 2.0-2.4 m high and 0.9-1.0 m wide. As for the door for chicken access, its height depends on the partition height, and the width is generally 0.25-0.30 m.

To prevent rainwater backflow, the indoor and outdoor floors of the chicken house should generally have a height difference of about 30 cm. In low-lying sites, the height should be raised to 45-60 cm.



Figure 1-50



Figure 1-51



Figure 1-52

The height, shape and size of the windows depend on the lighting and ventilation requirements of the house. The height of trough, water tank, drinking fountain and enclosure varies with breed and age. The partition height for net raising chicken house shall not be less than 2.5m.

Chapter II Major facilities in the chicken house

As the carrier of raising technology, supporting appropriate facilities and equipment is the key. Reasonable selection of facilities and equipment is helpful to ensure the realization of advanced technology in the chicken house. Major facilities in chicken houses include feeding equipment, drinking water equipment, cage system, environmental control equipment, etc.

Section 1. Environmental control equipment

The environment control of chicken houses is mostly realized by environment control equipment. Environmental control equipment includes heating equipment, cooling equipment, ventilation equipment, lighting equipment, cleaning and disinfecting equipment, etc.

1. Heating equipment

The brooder house is usually heated. Heating methods are divided into centralized heating and local heating. Central heating means a system that heats all parts of a building, which includes the following types:

Hot-water heating, using hot water circulated through pipes or radiators;

Hot-air heating, using heat source to heat the air, and the hot air is sent into the house through pipes.



Figure 2-1 Hot-Air heater



Figure 2-2 Hot air heater house

Coal stove and flue can be used for heating in small chicken houses.



Figure 2-3 Coal stove

Electric heater, air conditioner, etc.

Panel heating and space heating by means of wall, floor, baseboard, or ceiling panels with embedded electric conductors or hot-air or hot-water pipes.

Local heating means a system that heats some parts of a building. The main equipment includes infrared lamp, brood umbrella and brood cage, etc.



Figure 2-4 infrared lamp



Figure 2-5 Brood umbrella



Figure 2-6 Electric brood cage



Figure 2-7 Electric brood cage

2. Cooling equipment

2.1 Evaporative cooling, the principle of which is to absorb the heat of vaporization when water evaporates to reduce air temperature or increase the heat dissipation of chickens, is suitable for the dry hot areas. The problem with evaporative cooling is that it uses spray circulating water to

cool the air, which increases humidity and limits its range of applications.

Evaporative cooling is usually divided into direct evaporative cooling and indirect evaporative cooling. There are two types of direct evaporative cooling equipment: spray chamber and spray packing. Indirect evaporative coolers are similar to air-air heat exchangers.

2.2 Wet curtain fan cooling system (wet pad cooling system). The combination of wet curtain and fan is the most common and economical method of cooling and humidifying, especially in summer and in enclosed chicken houses. Wet pad cooling system is composed of wet curtain, fan, circulating water and control devices. The wet curtain device relies on the formation of negative pressure in the chicken house to cool down. In summer, the air goes into the chicken house through the wet curtain, reducing the temperature of the air and playing a cooling effect. The house temperature can be reduced by 5 ~ 8°C.



Figure 2-8 Wet pad cooling house Yukou



Figure 2-8 Wet pad cooling house Yukou

The number of fans and wet curtain areas should be determined according to local climate, chicken size, stocking density, etc. The space between the wet curtain and chicken cages had better be 2-3 meter to avoid the direct cold wind on chicken body and reduce the damage to the wet curtain caused by cleaning and egg collecting.

The wet curtain is currently equipped with sun shader so as to avoid direct sunlight, the increase of water temperature and the impact on cooling effect, which can also extends the service life of the wet curtain.

Common materials of wet curtains are poplar wood shavings (can be used for 1 year) and corrugated fiber paper (can be used for 5 years).

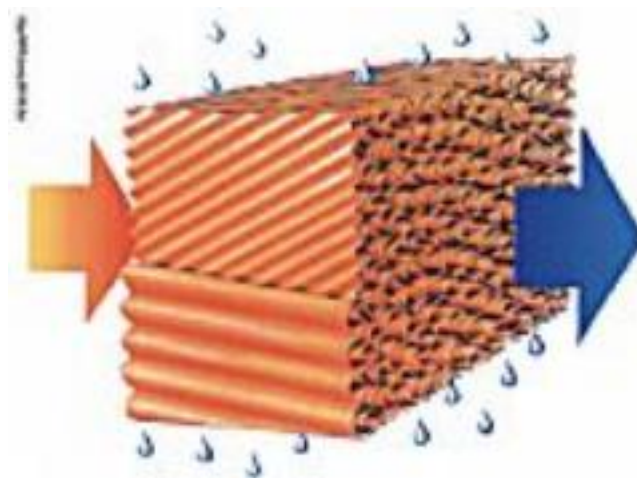


Figure 2-9 Wet pad material

3. Spray cooling system

Spray cooling system is to spray water into mist particles, so that the water quickly vaporizes to absorb the obvious heat in the chicken house. It has certain cooling effect, but increases the humidity in the house, so it is generally required to work intermittently.

Under normal circumstances, the spray plays a cooling role through several ways: the sprinkler sprays water into foggy particles with a diameter less than 0.1 mm. Then, the foggy particles floating in the chicken house absorb a lot of sensible heat in the air, which will quickly vaporize; Spray particles can create a state of local cooling, causing air

convection in the house; Some of the water is sprayed on the chicken body, which can directly absorb heat from the chicken and vaporize to cool the chicken.



Figure 2-10 Spray cooling the chicken house

2. Ventilation equipment

Chicken house ventilation is generally divided into natural ventilation and mechanical ventilation. Natural ventilation is to use the structure of the chicken house, which is located in a well-ventilated area. Another way is to artificially increase air vents, ventilation windows, doors and windows and other air inlets. Natural low temperature air is used to achieve ventilation effect, reducing the heat stress effect of the chicken.



Figure 2-10 Small windows in chicken house Yukou

Mechanical ventilation is to install mechanical fans in the chicken house. Large air volume is used to achieve active air circulation, so that the heat in the chicken house and odor can be discharged outdoors, so that the chicken house to keep in a comfortable environment.

The area of the natural ventilation inlet should be about 1/3 of the chicken house building area, the total amount of fans needed to open according to different environmental temperature to determine; the size of the fan used for mechanical ventilation should also be considered in combination with the size.

Ventilation equipment includes axial fan, centrifugal fan, ceiling fan, circular fan, etc.

Axial fan has advantages including large air volume, low energy consumption, low noise, simple structure, etc., Besides, it can supply air and exhaust air.

The advantage of centrifugal fan is high pressure. It can also be used for hot air and cold air transmission.

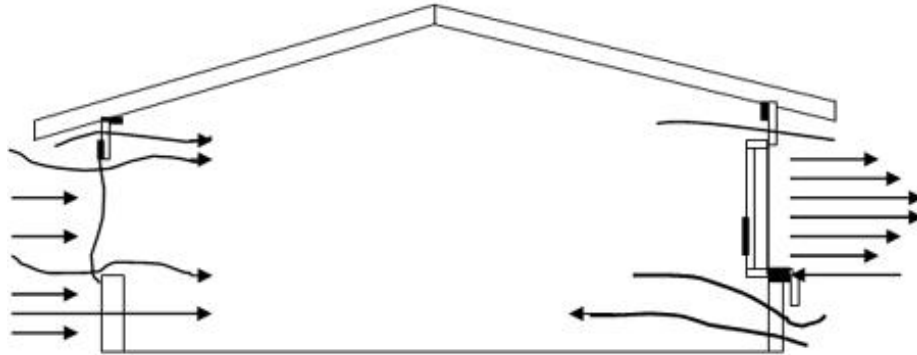


Figure 2-10 Chicken ventilation ways



Figure 2-11 Wet pad cooling house Yanqing



Figure 2-12 Wet pad cooling house Yukou



Figure 2-13 Longitudinal ventilation, Zunhua



Figure 2-14 Indoor tuyere, Zunhua

4. Lighting equipment

Lighting is an important environmental factor in poultry farming. Lighting affects productivity, animal welfare and growth rates. At present, the most common artificial lighting equipment in small farms is the incandescent lamp. Although the initial investment is small, the luminous efficiency is very low, about 20 percent of the fluorescent lamp. Fluorescent bulbs are much better than incandescent bulbs in terms of energy consumption. Generally, the appropriate light intensity in the chicken house is 5 to 10 lux. If it is a 15-watt uncovered incandescent lamp, it should be installed at a vertical height or with a straight-line distance of 0.7 to 1.1 meters from the chicken body. The distance between the lamps should be 1.5 times the distance between the lamps and the chickens, and the horizontal distance between the lamps and the wall should be 1/2 the distance between the lamps. The installation

position of each lamp should be staggered and evenly distributed.

If it is a fluorescent lamp, the distance between the lamp and the chicken is the same as that of an incandescent lamp, and the light intensity is four to five times greater than that of an incandescent lamp. So, to get the same light intensity, you need to install white light with less power.

With the development of LED technology, the LED lamps have been gradually used in poultry houses these years. The energy consumed by LED lamps is 80% to 85% less than incandescent bulbs. In addition, LED lights don't flash like fluorescent lights. Because chickens have sharper eyesight than humans, they are more susceptible to flashing lights.

The number of bulbs to be installed in a chicken house can be determined according to the lamp spacing and the distance between the lamp and the wall specified above, or the number of bulbs required can be calculated according to the effective area of the chicken house and the power size of a bulb, and then arranged and installed.

The automatic lighting controllers are commonly used in chicken houses, which can turn on and off the light on time, and ensure that the light intensity and light time are accurate and reliable.

Automatic lighting control systems have been used in recent years.



Figure 2- 15Automatic light control



Figure 2-16 The lighting in the chicken house Yukou



Figure 2-17 The lighting in the chicken house Yukou



Figure 2-18 Zunhua



Figure 2-19 Zunhua



Figure 2-20 Zunhua

5. Cleaning and disinfection facilities

For personnel disinfection, use foot disinfection pool and ultraviolet radiation.

For vehicle disinfection, use wheel cleaning disinfection pool and body washing spray machine.



Figure 2-21 Disinfecting pool



Figure 2-22 Portable spray disinfecting



Figure 2-23 Portable spray disinfecting

Section 2. Basic equipment

The basic equipment includes cages, feeding and drinking water equipment, etc.

1. Cages

There are brooding cages, growing cages, egg laying cages and breeder cages. The cage is composed of bottom net, top net, front net, back net and side net.

The characteristics of cages: stepped cage, half stepped cage, laminated cage. The brooder cages are usually 3-4 layer upon layer, the heat source can be electric heating wire, hot water tube, electric bulb etc. Also, coal stove or underground flue can be used to increase the house temperature.

The growing cages are usually made up by 3 to 4 layers of stepped cages. With larger cage space, they are convenient for the growth and development of the grower chickens.



Figure 3-24 Electric brood cage



Figure 2-25 Brood cage



Figure 2-26 Growing cage



Figure 2-27 Growing cage

3. Brooding equipment

The brooding equipment is slightly different in production systems. For the floor brooding, mainly electric or gas brooding umbrella is adopted, which has simple structure and less cost and is more suitable for small-scale chicken farms. For the cage brooding, generally laminated chicken cages will be used, which can make full use of space, cover an area of small, high thermal energy utilization. It is more suitable for large and medium-sized chicken farms.



Figure 2-28 Floor brooding



Figure 2-29 Net brooding



Figure 2-30 Cage brooding



Figure 2-31 The brooding cage using the hot air system

4. Feeding equipment

Feeding equipment generally includes storage tower, feeder, feed trough, feed barrel, and so on.

The feed line includes coil spring type, cable plate type, chain plate and track type, etc.



Figure 2-32 Feeding storage tower



Figure 2-33 Feeding machine in the house



Figure 2-34 Feed barrel for brooder chicken



Figure 2-35



Figure 2-36 Feed barrel for layers



Figure 2-37 Feeding box and feeding line in free range house



Figure 2-38 Feeding line for cage system

5. Drinking water equipment

Drinking water equipment includes water pumps, water towers, filters, limiting valves, drinking water, etc.; The types of drinking water: flume type (free-range), vacuum type (flat), hanging tower type (flat), cup type and nipple type (various), etc.



Figure 2-39 Water trough for free range chicken



Figure 2-40 Water trough for free range chicken



Figure 2-41 Water nipple



Figure 2-42 Water nipple with a cup



Figure 2-43 PVC pipe and water nipple in cage system



Figure 2-44 Water nipple in cage system

Section 3. Perching and egg-laying equipment

1. Racks and perches



Figure 2-40 Racks in the free range chicken house



Figure 2-41 Perches in the free range chicken house



Figure 2-42 Perches in the free range chicken house



Figure 2-43 Perches in the free range chicken house

2. Egg-laying box

Egg laying boxes should be equipped in a 4-6:1 ratio according to the number of hens in ground raising or free ranging. The egg-laying box can

be made of bamboo, brick, iron sheet. It can also be purchased from professional company.



Figure 2-44 Egg laying boxes made of bamboo



Figure 2-45 Egg laying boxes made of iron sheet



Figure 2-146 Egg laying boxes made of bricks



Figure 2-47 Egg laying boxes in the chicken house



Figure 2-48 Hainan layer farm



Figure 2-49 Egg laying boxes with curtains

3. Cleaning equipment

Manure cleaning methods: decentralized and centralized.

Dispersing manure removal refers to cleaning feces once or twice a day.

It is often used in ordinary floor rearing and cage rearing.

Centralized manure removal is used every few days, months or a

feeding period, mainly in floor or high bed cage.

High bed cage raising or floor raising is, with the cage or net frame being elevated high, about 1.8m away from the ground inside the house. Feces fell on the ground will be concentrated to clear once or twice a year. The feces can be cleaned by machinery or through manual work.

Under this condition, attention should be paid to strengthen ventilation in the chicken house, so that the excretion of chicken manure can quickly dry, mildew odor due to decay and fermentation can be avoided, which affects the growth and development of chickens and normal egg production.

Dung cleaning machine: traction scraper and conveyor belt dung cleaning device.

The scraper is pulled by rope, and the excrement is concentrated. The structure of the traction scraper is simple and is convenient for maintenance, but the wire rope is easy to be corroded and broken by feces pollution.

Attention should be paid to the maintenance and repair of all parts of the machine, especially the parts that are easy to corrosion. Frequent check is necessary.

Conveyor belt manure cleaning device: often used for feces cleaning between up and down chicken cages in chicken houses with high density. Each layer of the cage has a set of conveyor belts. Belt material is

generally nylon canvas or rubber products. In this way, attention should be paid to material selection and installation to avoid conveyor belt deformation and deviation.



Figure 2-50 Mechanical manure cleaning



Figure 2-51 longitudinal manure truck



Figure 2-52 Manure exit



Figure 2-53 Manure exit transportation

4. Feed processing and storage equipment

For a large chicken farm, there had better be its own feed processing plant, which will help control the feed quality and the cost. The basic feeding equipment includes crushing and mixing equipment, granulating equipment, cooling equipment, conveying and hoisting equipment, etc. when necessary. At least there should be a feed storage warehouse in the farm.



Figure 2- 54The feed plant in chicken farm



Figure 2-55 The feed storage warehouse

6. Automatic system configuration

With the development of modern poultry raising, some automatic systems are popularly used in some large poultry companies. They usually include automatic feeding system, drinking water system, manure removal system, automatic hatcher, automatic egg collection system, etc., which can greatly improve the production efficiency.

For the automatic egg collection system, the more commonly used type is conveyor belt type. The eggs coming from the cage rolled into the egg tank, fell on the conveyor belt and were transferred to the end of the chicken house for centralized collection or they were directly transferred to the egg warehouse for collection.



Figure 2-56 The automatic raising system in chicken house



Figure 2- 57The automatic egg-collecting system

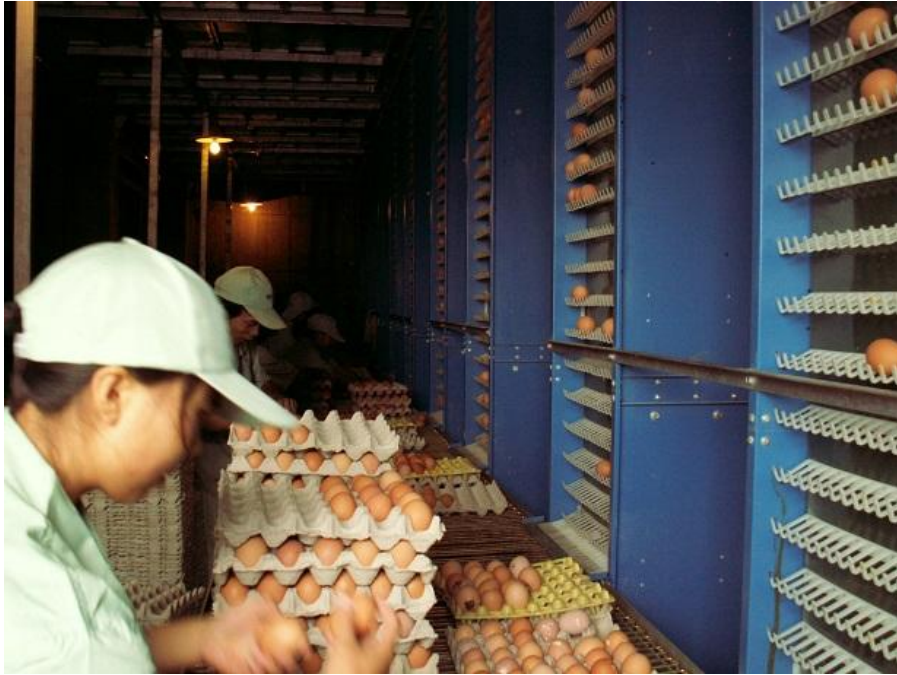


Figure 2- 58 The automatic egg-collecting system



Figure 2-59 The automatic egg-collecting system

The incubators have box type, tunnel type, using microcomputer automatic control, automatic egg turning, automatic temperature control and humidity control. They can continue to incubate even after power failure. These incubators have color steel plate structure and good thermal performance.

6. Other auxiliary devices

Decompression tank, the filter, debeaker, the starter plate, syringe, the thermometer, temperature and humidity meter, illuminometer, etc.

Chapter III The elite chicken breeds

Section 1. Tips for chicken breed selection

Many factors should be considered before selecting a chicken breed.

(1) The purpose. According to their usage, chickens may be mainly classified into four types: meat type (broiler), egg type (layer), dual-purpose type, and ornamental type (a very small part).

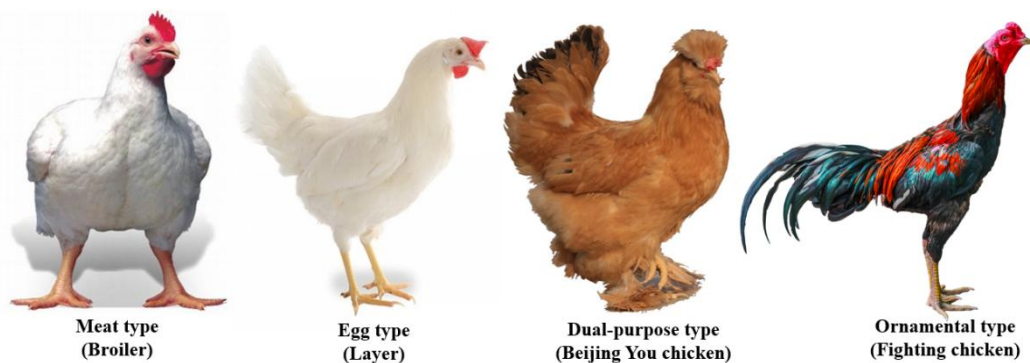


Figure 3-1 Different types of chicken breeds

(2) Breed characteristics. Many factors such as egg number and size, eggshell color, eggshell quality, production efficiency, fertility, and hatchability are most important for commercial egg producers.

Meanwhile, broiler producers often consider characteristics such as plumage color, feed efficiency, carcass quality, meat yield, and livability.

(3) The market. Breed selection should be market-oriented because people from different areas have their own culture and consumption habits. For example, in Nepal, customers' favorite eggshell color is brown, but in America white eggs are the preferable choice.

(4) The management level. For beginners or rough chicken rearing condition, breeds with high livability are a good choice.



Figure 3-2 Good rearing condition (left) and rough rearing condition (right)

(5) The hatchery and chick quality. The quality of day-old chicks matters immensely to the success of poultry businesses. Be sure to purchase chicks from the reputable or officially certified hatcheries. The chicks should be disease free and have already been vaccinated against Marek's disease.

(6) The transportation. Look for a hatchery nearby to see if there is a suitable breed or variety available, which is good for chick transportation. Because long-distance stressful transportation can cause illness in chicks, and can lead to weight loss, anxiety, and poor egg production.



Figure 3-3 Long-distance transport of day-old chicks

Section 2. High-productivity chicken breeds

There are a huge number of chicken breeds all over the world. The breeds of chickens listed in Table 3-2 are some famous standard breeds that were developed many years ago. But these specific breeds are not easy to be found in the commercial poultry industry because they have been crossed to produce different varieties and strains.

Table 3-2 Famous chicken breeds and their main characteristics

Name	Purpose	Eggshell Color	Original place
White Leghorn	Egg	White	Italy
Rhode Island Red	Egg	Brown	America
Australorp	Egg	Brown	Australia
White Plymouth Rock	Egg and meat	Brown	America
New Hampshire	Egg and meat	Brown	America
Cornish	Meat	Brown	United Kingdom

(1) White Leghorn



Figure 3-4 White Leghorn

(2) Rhode Island Red



Figure 3-5 Rhode Island Red

(3) Australorp



Figure 3-6 Australorp

(4) White Plymouth Rock



Figure 3-7 White Plymouth Rock

(5) New Hampshire



Figure 3-8 New Hampshire

(6) Cornish

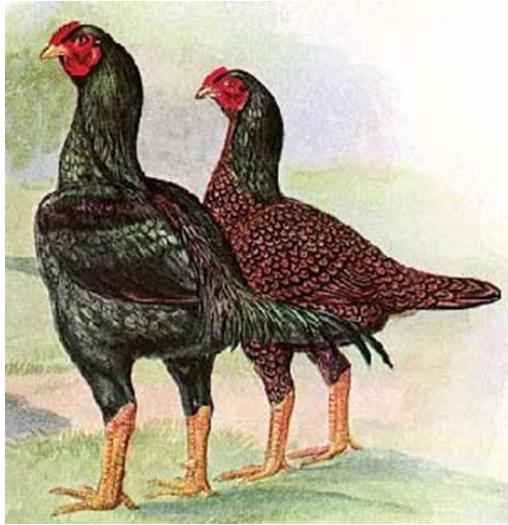


Figure 3-9 Cornish

Nowadays, with the development of chicken selection and breeding methods, the productivity of chicken, including both eggs and meat, has increased remarkably.

2.1 Commercial broiler breeds/strains

There are several common broiler chicken brands, such as Cobb, Ross, Arbor Acre, Hubbard, Marshall, and Anak, etc..

(1) Cobb

Cobb (500/700) is undoubtedly most farmers' choice. It is known for its heavy carcass and muscular brisket. It has strong legs and bones and is tolerant to heat. Cobb 500 is competitive in live weight, while Cobb 700 has outstanding breast meat yield and unbeatable feed efficiency.



Figure 3-10 Cobb 500

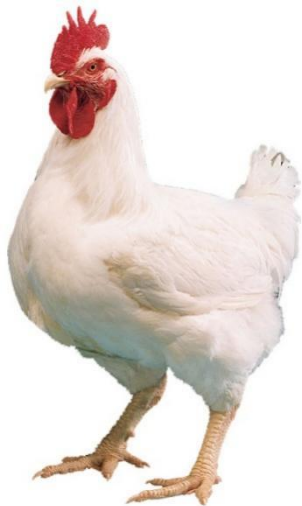


Figure 3-11 Cobb 700

(2) Ross

The Ross broiler strains (308/708) are fast-growing broilers. They possess high body weight, good breast meat, excellent feed conversion and lean meat. Ross 708 is a high yield broiler strain, and it is an improvement on Ross 308.



Figure 3-12 Ross 308



Figure 3-13 Ross 708

(3) Arbor Acres

The cornerstone of the Arbor Acres brand is the highly successful Arbor Acres Plus. The Plus is notable for the excellent broiler performance and good processing yield.



Figure 3-14 Arbor Acre Plus

(4) Hubbard

The Hubbard Efficiency Plus is another fast-growing broiler breed. It is renowned for good weight gains and excellent feed conversion.



Figure 3-15 Hubbard Efficiency Plus

Table 3-3 presents the performance objectives of these popular commercial broilers. Performance data came from the breeds' handbooks, which can only be achievable under good management and environmental conditions and when feeding recommended nutrient levels.

Table 3-3 Performances of the commercial broiler breeds

	Cobb500	Cobb700	Ross308	Ross708	Hubbard Efficiency Plus	Arbor Acres Plus
Live weight at 42d (g)	2952	2847	2918	2782	2948	2901
Live weight at 49d (g)	3617	3509	3583	3434	3606	3552
Live weight at 56d (g)	4227	4113	4203	4047	4209	4150
FCR at 42d	1.61	1.597	1.611	1.592	1.62	1.628
FCR at 49d	1.76	1.727	1.75	1.73	1.76	1.767
FCR at 56d	1.91	1.849	1.887	1.865	1.90	1.904
Eviscerated at 42d (%)	75.3	75.63	73.91	74.67		74.01
Eviscerated at 49d (%)	77.03	76.19	74.82	75.55		74.76
Eviscerated at 56d	77.35	77.65	75.56	76.32		75.42
Breast at 42d (%)	25.82	26.18	25.25	26.69		26.05
Breast at 49d (%)	27.32	28.12	26.04	27.69		26.89
Breast at 56d (%)	27.64	29.72	26.61	28.38		27.5

Note: FCR: feed conversion rate. Eviscerated%: eviscerated carcass (without neck, abdominal fat and internal organs) as a percentage of live weight. Breast%: breast meat (without skin and bone) as a percentage of live weight.

Besides the fast-growing white-feathered broilers, there are also some other broiler breeds been developed to meet the needs of selected markets, including those that are slower-growing, colored-feather, robustness, and suitable for indoor, outdoor, organic and free-range production. For example, the Rowan Range, and Hubbard Premium chicken breeds.



Figure 3-16 Rowan Ranger Gold

2.2 Commercial layer breeds/strains

Popular layer breeds are marketed under several main poultry brands, such as, Hy-Line, Lohmann, Nick, Bovans, Babcock, Hisex and ISA, etc.. And they produce a variety of layers with different plumage colors, eggshell colors and performances.

The color of eggs may be brown, white, pink/tinted, and green/blue (Figure 3-18). People from different areas of the world prefer different egg colors.

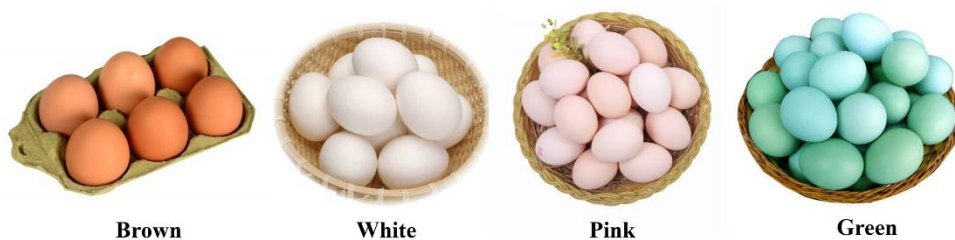


Figure 3-17 Different chicken eggshell colors

(1) Hy-Line

The Hy-Line brand holds a series of layer breeds that have high egg production, greater disease resistance, improved egg quality and superior livability. Hy-Line W-36 and W-80 lay pearl white eggs. Hy-Line Brown and Hy-Line Silver Brown produce brown shells. Hy-Line Sonia and Hy-Line Pink are both layers of tinted eggs.

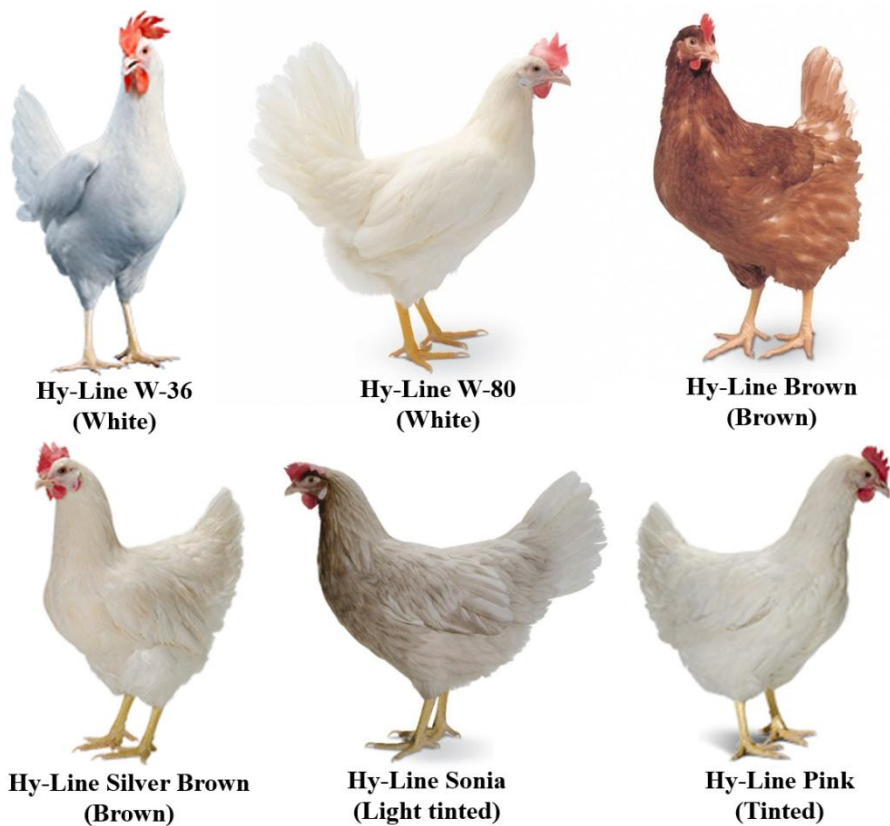


Figure 3-18 The Hy-Line layer breeds

(2) Lohmann

Lohmann offers a wide range of competitive breeds, which are distinguished by laying peaks, great persistency in laying performances and good shell stability as well as excellent health. Lohmann Brown, Lohmann Tradition and Lohmann Silver are three types of brown egg layers with different egg sizes. Lohmann LSL is well known for its

efficient production of quality white eggs. Lohmann Sandy is a white feathering layer for the production of cream coloured eggs.



Figure 3-19 The Lohmann layer breeds

(3) Nick

Nick also provides different layer breeds with brown, tinted and white egg colors.



Figure 3-20 The Nick layer breeds

Table 3-4 compares the performances of the brown egg layer breeds from different brands.

Table 3-4 The comparison among commercial brown egg layer breeds

	Hy-Line Brown	Lohmann Brown Classic	Nick Brown	Hisex Brown	Bovans Brown	ISA Brown
Livability to 100 weeks (%)	92	90-91	90-95	93	94	93
Age at 50% production (day)	140	140-150	142-152	143	143	144
Peak production (%)	95-96	94-96	94-95	96	96	96
Hen housed eggs to 100 weeks	453-467	461	456	471	464	466
Average egg weight in 100 weeks (g)	62.3	64.9	62-65	62.7	63.6	63.1
Egg mass per hen housed to 100 weeks (kg)	28.4	29.92	29.26	29.6	29.5	29.4
Average feed intake (g/d)	105-112	110-120	113-118	111	114	111
FCR	1.95-2.10	2.0-2.2	2.20	2.14	2.19	2.14
Body weight at culling (kg)	1.92-2.04	2.06	2.09	2.01	2.01	2.01

Note: Data came from the breeds' management guide, which can only be achievable under good management and environmental conditions and when feeding recommended nutrient levels. Egg performance data are based on the laying period to 100 weeks.