



REVIEW ON EFFECTIVE HOUSING SYSTEM FOR POULTRY PRODUCTION IN TROPICAL REGIONS, NIGERIA

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Abstract

In respect to the challenges faced in poultry housing in tropical environment, this paper aims to suggest best possible dimension and construction designs to consider for optimum poultry production in a constantly changing environment. It is challenging and contentious to gain access to different poultry housing arrangements and understand how each impacts the welfare of the birds. However, poultry production is often hampered by poor housing conditions, which can lead to disease outbreaks, reduced productivity, and financial losses for farmers. Therefore, considering the climatic conditions in Yewa-south (tropical region), the battery cage is suitable for the birds for effective spatial usage and also for effective management and control of pests and diseases. This paper offers critical reviews on studies relating to effective housing system using qualitative research method and also adopting effective methods to mitigate the impact on the birds, so as to manage the ugliness of the situation when exposed to pest and diseases under such housing system. There are a number of effective housing systems that can be used for poultry production in Nigeria. Among the housing system, Intensive housing has attracted lots of attention due to its economic benefits. These systems vary in terms of cost, complexity, and suitability for different climates and production methods.

Keywords: Battery cage, Poultry Production, Housing Systems, Tropical Region.

Introduction

According to Wikipedia, Poultry are domesticated birds kept by humans for the purpose of harvesting useful animal products such as meat, eggs or feathers, and the practice of raising poultry is known as poultry farming. These birds are most typically members of the superorder Galloanserae (fowl), especially the order Galliformes (which includes chickens, quails, and turkeys). The term also includes waterfowls of the family Anatidae (ducks and geese) and other flying birds that are kept and killed for their meat such as the young pigeons (known as squabs), but does not include wild birds hunted for food known as game or quarry.

The tropics are the regions of Earth surrounding the Equator. They are defined in latitude by the Tropic of Cancer in the Northern Hemisphere at 23°26'10.4" (or 23.43621°) N and the Tropic of Capricorn in the Southern Hemisphere at 23°26'10.4" (or 23.43621°) S. The tropics are also referred to as the tropical zone and the torrid zone (see geographical zone). In terms of climate, the tropics receive sunlight that is more direct than the rest of Earth and are generally hotter and wetter as they aren't affected as much by the solar seasons.

Climate change has been a significant threat in the tropics, it can have negative effects on poultry performance. Number of eggs produced can reduce, weight gain can be impaired and feed conversion efficiency can be affected during the dry season if measures are not put in place to mitigate the effect of heat (Ibiroga, 2019). Stress emanating from heat may impair the immune system of poultry and increase susceptibility to disease. When a bird begins to pant, physiological changes have already started within its body to dissipate excess heat. Even before the bird reaches this point, anything that you do to help birds remain comfortable and healthy will help maintain optimum growth rates, hatchability, egg size, egg shell quality and egg production (Ibiroga, 2019).

Poultry production is a major agricultural activity in Nigeria, contributing significantly to the country's food security and economy. Due to the wide variety of management techniques, diets, breeds, and species employed in the industry, comparisons are difficult. Even within similar systems, management variations can make it more difficult to assess welfare. For instance, chickens live in small groups and establish a pecking order, or social hierarchy. This social structure may become unstable in large flocks of birds or when the birds are mixed. The economical growing



of chickens starts from the correct and adequate design of the building for the appropriate breed and the environment of the location.

The designs of the poultry house for hens or broilers in some countries does not always based on engineering and scientific foundations but on some incorrect information, practices, or lack of accurate architectural information. For these reasons and others, there is a high mortality rate. In absence of these aspects and rules in poultry housing design led to different sizes and many non-standard types of sheds. In many situations, it is not adequate for large production, or using standard mechanization (feeding, drinking systems) for poultry production. Selecting the correct dimensions for the poultry house helps in the use of standard mechanization and adequate design of the ventilation system. Not using accurate building rules in poultry building design could create production problems, high production costs, lower returns, and wastage of different types of energy. This article discusses the correct dimensions and conditions to consider optimising production in the poultry industry.

Poultry housing system

According to poultry mania, there are generally four types of houses commonly found among poultry farmers which are; The free-range or extensive poultry house system, The semi-intensive poultry house system, Folding units' poultry house system, Intensive poultry house system (Deep litter poultry house system, Battery-cage poultry house system).

It is crucial to emphasize the type of poultry housing system used for chicken production. It shields the animals from the harsh environmental climate conditions, which could have a negative impact on the performance and productivity of the chickens if not properly oriented. The total amount of heat produced in a poultry house is the result of the heat produced by the birds, the environment, and the biodegradation of faeces (Gorgon 1982; Mason 1984; Clark, 2013). As a result, the type of housing system chosen will greatly influence the management style chosen for the poultry farm.

Intensive Poultry House System

Naturally ventilated open housing system

Due to its ease of use, cost-effectiveness, and ability to easily control the generation of heat within the building through natural ventilation, the open poultry housing system has been associated with the tropical region (Daghir, 2008; Qureshi 2001). The welfare, productivity, and performance of chicken can be disrupted by the invasion of insects, rodents, birds, and other small predators. Dwarf sidewalls are raised to the roof eaves with corrugated wire mesh to deter predators in an effort to solve this issue. Insecticide-filled gutters are also built around the house to deter insect invasion.

There are a number of effective housing systems that can be used for poultry production in Nigeria. These systems vary in terms of cost, complexity, and suitability for different climates and production methods. Some of the most effective housing systems for poultry production in Nigeria include:

a. Deep litter system:

This system is relatively inexpensive and easy to manage. It involves spreading a layer of litter, such as wood shavings or sawdust, on the floor of the poultry house. The litter absorbs moisture and helps to control dust and

ammonia levels.



Plate1: Showing the chicks in a deep litter system

(Poultry Mania, 2021)

b. Battery cage system:

This system is more expensive than the deep litter system, but it is also more efficient in terms of space usage. Battery cages are stacked on top of each other, which allows for a higher stocking density.

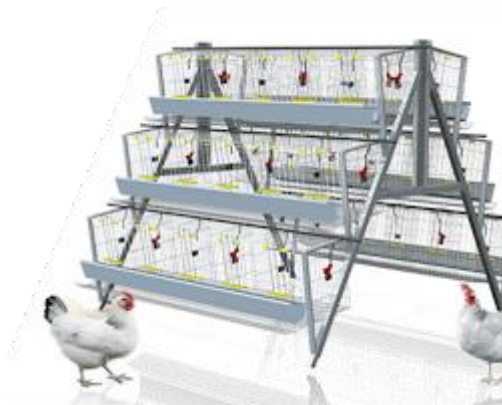


Plate2: Showing the battery cage system

(Poultry Mania, 2021)

c. Free-range system:

This system allows chickens to roam freely outdoors. It is the most natural system for poultry production, but it can be more difficult to manage and control pests and diseases.



Plate3: Showing the chicks in a free-range system

(Poultry Mania, 2021)

Construction of Poultry Farm Building

Basic tips for construction of open sided poultry house have already been discussed in this chapter. However, with increasing trends towards environment-controlled housing system, some important considerations for construction of poultry farm building are given below;

Building orientation

In order to reduce the exposure of sidewall to direct sun radiation the poultry house should be orientated in the east-west direction (Daghir, 2008). This is very vital, because heat stress in birds can be hastened when they are exposed to direct solar radiation. Deep litter rearing may allow the birds avoid direct sunlight but this may lead to clustering or overcrowding of birds in an area of the house. Consequently, make cooling difficult and in severe cases this leads to stampede and even death Daghir (2008).

House width, length and height

The east-west orientation of a poultry house may reduce the benefit of prevailing winds blowing from east or west. Therefore, Daghir (2008) recommended that the width of the building should not exceed 12m to prevent this problem. In addition, the problem of uneven air exchange rate and temperature within the building is eradicated. Additionally, the design must take into account the operations and services provided by the building's professional and commercial poultry farmers. These tasks could involve moving chickens, feeding them, de-pecking them, managing waste, immunizing them, and more. Longer pen houses could therefore be difficult to maintain, especially if everything is done by hand. To facilitate easy circulation and service delivery, doors can be placed at intervals of 15–30 m (Daghir, 2008). According to Qureshi (2001), it is preferable to account for the number of tiers that will be used when designing battery cages. In comparison to three and four tier cage systems, the two-tier cage system makes it simple to exchange air inside the building. Therefore, it is recommended that rows of cages should not exceed three with centre aisles not less than 1.2 m and a minimum height difference of 1 m from the ceiling.

Roof slope and Roof overhang

A roof slope of 45° is recommended because the angle reduces the heat gain of the roof from the direct solar radiation; maximizes the distance of the bird from the heat accumulated under the roof; quick escape of the heat accumulated under the roof through ridge opening, maximizes air space to improve air exchange rate; and open space above for installation of equipment (Daghir 2008 and Clark, 2013)]. On the other hand, the slope of an insulated roof is influenced by the insulation's quality. Building sidewalls can be protected from both direct and indirect solar radiation by using the roof overhang. However, the height of the sidewalls affects the length of the roof overhang. The possibility of sidewall heat gain reduced to about 30% by roof overhang shading if properly applied at a roof slope of 45° (Clark, 2013).

Ridge opening



The difference in air density is what causes hot air to naturally rise above cooler air. The addition of a ridge opening can improve ventilation in a poultry house by creating a stack effect. To avoid insufficient airflow and circulation, buildings must have an adequate setback from each other (Saxena and ketela, 2000). In insulated poultry houses, however, ridge opening has reportedly been found to be ineffective due to indoor temperature uniformity (Timmons, 1989).

Floor

If a deep litter system is used, the floor type should be moisture-proof and simple to maintain. For buildings that regulate the environment, plain concrete floors are advised. However, elevated floors in the form of platforms and slat floors are also designed for deep-pit systems and two- or three-tier cages, respectively. A sub-floor is created for manure collection under slat and in between elevated levels. Subfloors require additional durability since they must be cleaned and sanitized on a regular basis. When using a multi-tier cage system, the floor needs to be sturdy enough to allow the cage system's frame to be readily anchored toward the manure disposal end. At the manure collecting side of the automated cage system, a deep trench is formed in the floor for the installation of dung collection belts. In order for droppings to be conveniently gathered and removed from the shed, this pit should be two feet away from the fans' wall and directly beneath the manure belt's projection. Even though the cage system has a level adjustment mechanism, the floor must still be level and smooth.

Layout Plan for Poultry Farm Building

The administrative block, labor colony, kitchen, and main feed store should be kept away from the sheds to prevent direct contact between visitors, vehicles and the birds, and there should be two entrances, one toward the main entrance and the other toward the side of the shed, for an efficient layout of the poultry farm building. Vehicle dipping pits should be built near the main entrance, a small feed delivery room with an underground hopper or feed bin should be built next to the front or side walls of the shed, and the generator and control panel rooms should be built on the side facing the fans of the shed. Ideally, there should be 100 feet between sheds, and brooding, growing, and laying should not occur barns on the same farm. Always keep sheds spaced apart enough so that the ventilation systems won't interfere with one another. The sheds and all other parts of the poultry farm should be elevated above the ground, connected to the drainage system, and connected to one another via washable tunnels.

Supporting Structures

The proper estimation of supporting structures, such as feed storage, drainage, passages, dipping pits, generator rooms, spare parts stores, administrative offices, labor colonies, kitchens, washrooms, weighing bridges, disposal pits, and boundary walls, is one of the most crucial factors that must be taken into account. Feed stores need to be large enough to hold feed for the necessary amount of time. From a building standpoint, a feed store has to be dry and well-ventilated. All farm building components should be sufficiently elevated above the ground and connected to a clear drainage system. In order for agricultural operations to be successfully carried out during the rainy season, appropriate routes should be used to link the various farm components. There should be dipping holes built at the main entrance for both guests and cars. Additionally, dipping pits must to be built at each shed's entrance. The distance between the generator room and the production shed should be sufficient to minimize noise and smoke intrusion. Since environmental control buildings have a negative pressured system, it is advised that a generator room be built in front of exhaust fans to direct harmful fumes away from the shed. To repair and maintain the farm's equipment, a modest workshop and a store for spare parts need be built. Another crucial part of a chicken farm is the weighing bridge and the dead bird dumping area.

Conclusion

Poultry housing layout, construction, insulation, brooders and modern poultry instruments contributes a great in modern day poultry units. Each of these has its due importance for optimum production of meat and eggs. Proper housing system, designs and appropriate dimensions and equipment quality aid in poultry production.

Before a site for a poultry is being considered, bio-security is rarely included in the planning phase. However, for effective long-term use, bio-security must be a factor in the selection process;



- Choose a location distance from other poultry farms to prevent spread of disease agents. A minimum of 500 meters is suggested i.e farms should not be located close to hatcheries, feed mills or processing plants.
- Consider the direction of the prevailing winds to take advantages of ventilation. Properly zone the location of housing for younger birds, so they are not downwind from housing with older birds.
- Avoid building in lowlands that are prone to flooding such as flood zones, waterways and wetlands.
- Avoid construction in wetlands frequented by migratory birds that are known carriers of catastrophic diseases such as Avian Influenza and Newcastle and also avoid stagnant waters region.
- Construct poultry houses away from main roads that may be used by poultry transport vehicles. A minimum of 300 meters from a road is suggested.

These factors will enhance the functionality of the building and the performance of the birds. Therefore, the battery cage is suitable for the birds for effective spatial usage and also for effective management and control of pests and diseases, however the deep litter system should still be adopted for the chicks of 1-16 weeks.

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