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Sustainable Poultry Production : Controlled Environment

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In the context of Poultry Production, the prevailing environmental conditions provided to poultry flocks exert a substantial influence on their performance metrics and overall economic viability. The elemental microenvironment encompasses essential parameters such as feed quality, lighting regimen, air composition encompassing temperature, humidity, pathogenic load, and ammonia levels, water availability, and the quality of litter material.

Given the homeothermic nature of avian species, the meticulous regulation of internal body temperature assumes paramount importance. Adult poultry, for instance, exhibit a normothermic range spanning 105°F to 107°F. Conversely, recently hatched chicks commence at 103.5°F, progressively escalating until attaining a state of equilibrium approximately three weeks post-hatch. The delineated thermal comfort range for poultry is contingent upon the specific species and developmental stage, with juvenile specimens manifesting heightened adaptability to elevated ambient temperatures. It is imperative to note that deviations from the stipulated thermal comfort range invariably precipitate a decline in the efficiency of poultry feed conversion.

Given the endothermic metabolism of avian organisms, a vital metabolic byproduct is thermal energy, necessitating effective dissipation to the surroundings to uphold a consistent internal body milieu. This intricate thermoregulatory equilibrium is pivotal for safeguarding the holistic welfare and productivity of the poultry cohort.

Free Range system of Housing

- Even though this system of housing is less invasive, Loss of egg may be a big problem: as hens lays eggs everywhere in this housing.
- As there is no separate housing, Loss of poultry birds due to prey-predator mechanism.

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- Even though birds acquire immunity to certain extent infectious (viral & bacterial) and parasitic problems do occur.

Semi-Intensive system of Housing

- This system of housing requires routine cleaning and removal of litter material from the pens.
- This system is invasive over free range as it attributes to high cost for fencing

Environmentally controlled housing/ Intensive housing

Within this housing configuration, meticulous attention is dedicated to the rigorous management of birds' optimal prerequisites. The architectural layout is carefully devised, presenting a longitudinal axis oriented in the east-west direction. On the western side, strategically situated exhaust fans operate in tandem with evaporative cooling pads positioned on the eastern flank. These discerningly arranged elements not only facilitate heightened air circulation but also introduce efficacious evaporative cooling modalities, thereby amplifying avian comfort.

A pivotal foundation of this strategy entails the integration of automation. Automated systems governing both drinking and feeding processes obviate manual labor, thereby effectuating substantial reductions in associated expenditures. This streamlined automation culminates in augmented operational efficiency, concurrently curtailing financial outlays.

By virtue of the harmonization between these architectural principles and automated mechanisms, a meticulously controlled microenvironment is systematically nurtured within the housing framework. This methodically engineered microclimate resonates precisely with the distinctive requisites pivotal to the sustenance of avian well-being. The orchestration between the building's orientation, advanced ventilation and cooling provisions, and the automated administration of sustenance collectively fosters an ecosystem conducive to the holistic welfare and productivity of the avian occupants.

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a). Ventillation

Fans, openings, heaters (radiant, space, make-up air heaters) and controls. Controls are needed to adjust ventilating rates (fan controls). Supplemental heating rates, and air velocity rates(fan controls), supplemental heating rates, and the air velocity through openings as weather, bird age and size change.

b). Cooling house

Low pressure fogging system

Low pad and fan system- pressurized and vaccum system

Fog and Fan System

High pressure nozzle system

c). Temperature control in Environmentally controlled house

Various heaters are used for supplementing heat in poultry houses including radiant, space and air heaters.

d). Feeding in Environmentally controlled house

Feed monitoring systems are available to measure amount of feed consumed by bird. In general in this housing 7-8 feedings per day is to be followed.

e). Light management

As these houses are light proof monitoring and control system should provide scheduling of lights for use. A pre program lighting schedules over life of flock is useful for management. In this a desired intensity of light is to be provided.

Environmentally Controlled houses in Broilers

In the realm of technologically advanced commercial broiler production, contemporary climate-controlled housing and sophisticated equipment have enabled precise manipulation of microclimates. Despite the enduring prevalence of conventionally open-sided elevated housing for broilers due to its cost-efficiency, the emergence of ventilated housing has garnered attention. Ventilated housing serves multifaceted purposes, including the expulsion of excessive heat and moisture, the elimination of dust and odors, the regulation of detrimental gas accumulation such as ammonia and carbon dioxide, and the facilitation of oxygen supply for respiration.

Empirical studies shed light on an intriguing dynamic. While a spectrum of bird performance metrics, encompassing live body weight, feed intake, feed conversion ratio, mortality rate, production efficiency index, litter pH, moisture content, and airborne ammonia levels, remained largely unaffected by housing types, a discernible pattern emerged. Broilers reared within Environmentally Controlled (EC)

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houses, even under higher stocking density conditions of 20 birds/m², exhibited a marginal reduction in mortality rates and a corresponding elevation in production efficiency index (as evidenced by the research of Farhadi and Hosseini in 2014). This intriguing phenomenon may be attributed to the augmented precision and enhancement of environmentally controlled conditions inherent to EC housing in contrast to conventional alternatives.

Environmentally Controlled houses in Layers

In the domain of layer poultry housing, the adoption of controlled environments is prevalent, with multi-tier cage systems being the norm. Among extensive poultry farms, the utilization of controlled-environment setups is standard practice, ensuring optimal thermal conditions for the birds (Glatz and Bolla, 2004). The performance of birds within controlled environment facilities surpasses that observed in naturally ventilated structures, as conditions can be meticulously managed to align with the birds' thermal comfort range. The investments made in environmentally controlled housing are met with commensurate returns, attributable to elevated productivity standards and reduced mortality rates.

Conclusion

Optimal climate control significantly enhances avian performance, yielding improved feed conversion ratios and enhanced liveability. This, in turn, leads to augmented revenue compared to conventional approaches. Notably, the costliest aspect of climate-controlled broiler housing pertains to power consumption. While the initial investment outlay for environmentally controlled (EC) housing is considerable, the long-term returns are substantially higher owing to elevated production benchmarks and reduced mortality rates.

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