Solar system for poultry farm in ghana pdf

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Poultry is an integral part of livestock production system in Ghana not only as a source of animal protein but for income generation and employment. In developed countries, poultry is managed in housed temperature-controlled systems. These environmental control systems, though costly, are able to mitigate some of the negative impacts of climate change. However, such sophisticated and costly systems are rare or non-available in developing countries such as Ghana where poultry is directly or partly exposed to the ambient environment.

Several management and nutritional strategies have been examined to mitigate HS on broilers with limited and varying success (Akhavan-Salamat and Ghasemi 2016; Wasti et al. 2020; Ariyo et al. 2023; Kwakye et al. 2023). This may be due in part to the lack of comprehensive delineation and understanding of the major biological mechanisms that underlie the role of these strategies. Ultimately, producers have to consider heat tolerant breed types or chicken strains adapted to changing climatic conditions.

Diurnal change in rectal temperature has been used as a measure of heat tolerance in humans (Shvartz et al. 1977), cattle (Turner 1984) and chickens (Chen et al. 2013). Tolerance herein is defined as the ability of an animal to physiologically adjust to high THI exposure and sustain productivity. For a chicken to be heat tolerant, it must adjust its physiology to express minimal change in rectal temperature when exposed to high THI compared to their heat sensitive counterpart that is expected to express high change in rectal temperature.

The ambient temperature and relative humidity were measured hourly from 06.00 AM to 06.00 PM using Thermo-Hygro Data Logger (-40--80?C; 0%--90%RH). The temperature-humidity index (THI) was calculated using the following formula (Mader et al. 2006).

The hourly ambient temperature and relative humidity are presented in Fig. 1. The average ambient temperature and relative humidity at 6.00 AM were 270C and 74%, respectively. The ambient temperature rose steadily to about 33.50C at 2.00 PM and declined to about 300C at 6.00 PM. At the same time the relative humidity declined to about 55% at 2.00 PM and increased to about 65% from 4.00 to 6.00PM. The THI index over the course of the day is shown in Fig. 2. The THI index at 6.00 AM was about 77.5, peaked at 83.5 at 3.00 PM, and decreased to about 81.5 at 6 PM.

The average hourly rectal temperatures are presented in Fig. 3. The average rectal temperature for the flock was 39.9 ?C at 6.00 AM and gradually rose to about 41.30 ?C at 9.00 AM. Hereafter, the rectal temperate stayed relatively constant until after 3.00 PM when it decreased to about 40.700C at 6.00 PM. The relationship between body weight gain and DRTSA is quadratic (Fig. 4) indicating that the chickens with the least change in DRTSA gained more weight compared to those with significant changes in DRTSA.

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Ricky A. Poku, Ebenezer Agyemang-Duah, and Sheila Donkor. The first draft of the manuscript was written by Ricky A. Poku, Ebenezer Agyemang-Duah, Sheila Donkor, Raphael Ayizanga, Romdhane Rekaya, Richard Osei-Amponsah and Samuel E. Aggrey, and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.