A Solar Energy Operated Brooder to Improve Food Security of Small-holder Poultry Farmers in Rural Lebanon

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Project Abstract

As the dependence on fossil fuels for energy source contributes to higher food production costs, ensuring food security for small farmers has become crucial. Current food production practices are deemed unsustainable with their excessive use of energy accompanied by increased emission of greenhouse gases with the attendant global warming effects. It is thus imperative to develop and integrate new technologies to reduce production costs with minimal environmental impact. On poultry farms energy demands are high especially during the first six weeks when the one week old chicks require supplementary heat to maintain their body temperatures. This heat is usually provided by brooders placed in proximity of the chicks and fuelled by electricity, gas or diesel. The current practice is energy intensive and not quite environmentally friendly. Accordingly, this research proposal aims at designing a solar-based brooding unit to heat a typical pen of 100 chicks while meeting the required specifications, standards and desired environmental conditions designated by ASHRAE and ASABE. For this reason, two models – a radiant unit and a convective unit – will be designed, modeled and evaluated for temperature, air velocity and relative humidity along with the appropriate ventilation rates. The convective unit will also be evaluated for air quantity and supply air temperature, whereas for the radiant unit the surface temperature will be modeled in order to achieve the desired environmental conditions. In efforts to promote agricultural development and promote the use of sustainable and reusable energy, this study will provide a comparison between actual energy expenditure and the estimated savings to be provided by the proposed design. A feasibility study for a model poultry house at the Agricultural Research and Educational Center (AREC), American University of Beirut located in the Beqaa, Lebanon, will also be provided along with a solar heating unit prototype.