DEVELOPMENT OF A SOLAR-POWERED AQUAPONICS WITH GROUND HEAT EXCHANGER (GHE) SYSTEMS FOR RED TILAPIA (*Oreochromis niloticus*) and BOK CHOY (*Brassica rapa subsp. chinensis*)

BARAYUGA, DONNIE M.
GANTE, JAY-AR D.
JUSTIMBASTE, MAE ANNE V.

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ABSTRACT

BARAYUGA, DONNIE M., GANTE, JAY-AR D., and JUSTIMBASTE, MAE ANN V.., Department of Agricultural and Biosystems Engineering, Central Luzon State University, Science City of Muñoz, Nueva Ecija, Philippines, **June 2023, DEVELOPMENT OF A SOLAR-POWERED AQUAPONICS WITH GROUND HEAT EXCHANGER (GHE) SYSTEMS FOR RED TILAPIA (*Oreochromis niloticus*) and BOK CHOY (*Brassica rapa subsp. chinensis*)**

Adviser: **ENGR. GLORIA N. RAMOS, M.Sc.**

Growth in population and urbanization have raised the demand for reliable access to fresh produce. Aquaponics could be a solution to this problem. For the cultivation of high-value crops that thrive only in colder regions, making their production in lowland areas challenging, it is necessary to devise alternative cooling systems for the production of high-quality crops. This study aimed to develop a solar-powered aquaponics with a ground heat exchanger (GHE) system under greenhouse conditions and evaluate its performance in terms of the growth and yield of Red Tilapia and Bok Choy. There were two treatments in the experiment: the cooling method (an aquaponics system with GHE) and the Control (an aquaponics system without GHE). Under GHE, the average temperature was maintained at 28.96°C, which was 1°C lower than without GHE. The aquaponics system in the greenhouse was solar-powered using a DC system. The system was designed to run on a 200-watt solar panel. The designed DC solar system operated effectively and was able to support the DC loads during the course of the study. Analysis of the data using a T-test showed a significant difference between the two treatments in terms of water temperature, dissolved oxygen, growth of Red Tilapia, and growth of Bok

Choy. Test results found no significant difference between the treatments in water pH, ppm, leaf width, and crop height.

Keywords: Aquaponics; Ground Heat Exchanger; Root-zone Cooling System; Red Tilapia; Bok Choy

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