ABSTRACT

An Investigation of the Effects of Increasing Stocking Density and the Application of Nightly Aeration on Tilapia Pond Culture

David Sebastian O'Neil Barrett

In Jamaica, the majority of freshwater tilapia fish farmers utilise semi-intensive culture methods for the production of *Oreochromis* red tilapia strains. The limitations of intensive culture are high investment costs, and land and water restrictions.

The utilisation of 2-hp AIRE-O_2 aerators for 10 hours of nightly aeration in stagnant pond systems facilitated increased production of an *Oreochromis* strain with increasing initial stocking densities from

$2/m^2$ - $9/m^2$, without incurring high additional investment costs.

Analysis of Variance and Regression Analysis indicated that for initial stocking densities of $2/m^2$ - $9/m^2$ with aeration, net yield increased significantly ($p = 0.009$; 2df) with increasing stocking density, however growth rates declined significantly ($p < 0.001$; 1df). Increasing stocking density as an isolated parameter, appeared to have had no significant effect on plankton abundance, dissolved oxygen (D.O.) concentration, temperature, survivorship and FCR.

It was financially feasible to double the initial stocking density from $2/m^2$ (without aeration) to $4/m^2$ (with aeration). The highest net return ($179,059/ha) was obtained for initial stocking density $4.1/m^2$ for 10 hrs of nightly aeration. The lowest returns were for initial stocking densities of $9.0/m^2$ ($28,861/ha) and $2.0/m^2$ without aeration ($8,933/ha).

Regarding management risks, $4/m^2$ was the least risk option (morning D.O. concentration and fish stress) at

the best financial return for the applied aeration regime.

Though not statistically significant, mechanical aeration qualitatively improved the pond environment (higher average D.O. concentrations and better growth rates) with increasing initial stocking density ($2.0/m^2$ to $4.0/m^2$). The applied aeration (10 hrs/2-hp) was inadequate for densities above $4.0/m^2$.

Pond D.O. was significantly affected by other factors such as wind, for aerated ponds ($p< 0.001$; 2df) and total grow-out period ($p< 0.001$; 1df) for all ponds.

For small/medium scale farms increasing productivity, an initial stocking density of $4/m^2$, with the applied aeration regime is recommended where there are limitations of water, land, management capabilities and financing. Higher stocking density may be sustained with increased aeration or water exchange.

(Keywords: David Barrett; increased stocking density; nightly aeration; tilapia)