ASSESSMENT ON THE USE OF TILAPIA AS BIOMANIPULATORS IN SHRIMP FARMING IN NEGROS OCCIDENTAL, PHILIPPINES

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The use of tilapia as biomanipulators in shrimp farming, or also known as green water technology, has played an important role in the current efforts in the Philippines to control luminous bacteria disease caused by *Vibrio harveyi*. At present, green water technology is most extensively used by shrimp farmers in the island of Negros, in the central part of the Philippines. While the contribution of tilapia as a biomanipulator is highlighted in the literature, the mechanism of action is not well-understood. This study was conducted mainly to assess the contribution of tilapia in green water system. The data were gathered came from shrimp ponds practicing basically two production systems: a) green water system (probiotics + tilapia) and b) closed/ semi-closed system (probiotics alone). There was no difference between luminous vibrio count ($p<0.05$) in both systems and that water quality was found to be similar ($p<0.05$). Because the green water system utilizes a bigger reservoir to raise the tilapia biomass, the net shrimp production was lower. In terms of direct cost of production, however, the green water system was around 10-15% lower than the closed/semi-closed system due to the significantly less aeration required. Also, in green water system, there was a more stable plankton environment during the early months of culture, which promoted better survival of shrimps. Various pathways are presented in the control of luminous bacterial growth in shrimp ponds by green water technology, namely: a) feeding on organic wastes and conversion to feces; b) selective foraging to increase the dominance of beneficial phytoplankton; c) bioturbation; and d) release in the water column of antimicrobials from mucus. The combined actions of these pathways and not just any single effect are believed to be responsible for the overall effectiveness of the green water technology.

A SIMPLE BIOECONOMIC MODEL TO OPTIMIZE TILAPIA STOCKING RATES IN SUB-TROPICAL MARKET ORIENTED POND AQUACULTURE

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This paper deals with the formulation of a simple empirical model for predicting feeding and fingerling costs of tilapia production in integrated managed ponds based on farm results from previous years. The inputs to the model are: i) pond area, ii) tilapia average stocking weight, iii) tilapia expected growth rate - monthly, iv) tilapia expected survival rate - monthly and v) fingerling, feed and table fish selling prices. Main outputs from the model are the a) recommended tilapia stocking rate, b) expected tilapia fingerling costs, c) recommended tilapia feeding schedule, d) expected feeding costs, e) recommended harvesting date, f) expected average tilapia final weight and g) expected net return per pond - considering tilapia fingerling and feed costs only. Once these parameters were calibrated, network optimization was used to define the optimal stocking/harvesting schedule for tilapia production in a polyculture system ran in a 12 ponds farm, with total area of 8.1 ha (32.4 acres)during a three years period. The simplicity of the model allowed a good response to the temperature variation influence over the main species growth rate, a key factor when producing fish in ponds under sub-tropical conditions. Furthermore, changes in harvested table fish prices, fingerling and feed prices could be easily introduced to the model and new stocking and feeding schedules could be calculated, allowing in time pond management changes due to market challenges. There is a good possibility that this model can be used in catfish production forecast with small modifications.