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RESEARCH REPORTS

Sustainable Aquaculture for a Secure Future

Title: Relationships Among Nutrient Inputs, Water Nutrient Concentrations, Primary Production, and Yield of *Oreochromis niloticus* in Ponds

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Abstract: Experiments were run to assess the physical, chemical, and biological processes leading to increased production of fertilized fish ponds in Thailand for approximately 5 months during wet season 1984 and wet and dry seasons 1985. Eight or 12 ponds (250 m²) were stocked with male Nile tilapia at 1 fish/m³. Ponds received fertilizer according to three different schemes: (1) low input inorganic (0.27 kg triple superphosphate, equalling 0.12 kg P ha⁻¹ d⁻¹); (2) high input organic (71.4 dry kg chicken manure ha⁻¹ d⁻¹); and (3) high input inorganic (14.3 kg triple superphosphate ha⁻¹ d⁻¹ and 4.3 kg urea ha⁻¹ d⁻¹). Treatments 2 and 3 yielded identical loadings of 2 kg N ha⁻¹ d⁻¹ and 3.2 kg P ha⁻¹ d⁻¹.

Ponds receiving high fertilizer inputs had higher nutrient concentrations in water, higher primary production, and higher fish production than ponds treated with low fertilizer inputs. At high fertilizer inputs, chlorophyll *a* content and primary production were similar for all ponds, but fish growth and adult yield were significantly greater in organically rather than inorganically fertilized ponds. This was attributed to increased heterotrophy by fish in ponds treated with organic fertilizer. Regression analysis indicated only marginally predictive relationships between total inorganic nitrogen or total phosphorus concentration in the water and primary production. Secchi disk depth was a reasonable predictor of both primary production and chlorophyll *a* ($r^2=0.67$). Diel temperature stratification was low, but correlated with air temperature, solar radiation, rainfall, and wind velocity. Diel oxygen stratification was more pronounced with inorganic fertilization, probably due to greater water clarity and more even distribution of primary production in organically fertilized ponds. Yield of stocked fish was correlated with rainfall and primary production.

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