

# Greenwater System: Benefits, Mechanisms, and challenges

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Several diseases have devastated the shrimp industry, and new diseases of unknown etiology are emerging. There is a need for a culture system that will enhance an aquatic ecosystem limiting the emergence of disease agents and shrimps tolerance to diseases, and which is environmentally sustainable. One potential candidate is the greenwater culture system (GW) which is an innovative technique practiced by shrimp farmers in the Philippines. In a GW system shrimp are cultured in water collected from a pond where tilapia or other fish species are grown. Two GW culture methods are used: 1) shrimp and fish are cultured in separate ponds; water used to culture shrimp comes from the fish pond, 2) shrimp and fish are cultured in the same pond; fish are isolated in a net pen inside the shrimp culture pond. Recently, the GW system was modified by adding another pond stocked with a carnivorous fish.

The GW system is believed to improve water quality and to enhance shrimps resistance to diseases. Lower nutrient levels, higher *Chlorella* counts, lower luminous bacterial counts, higher percentage yellow vibrios and lower available soil sulphur content were observed in ponds using the greenwater system. Improvement in water quality could be due to the bacteria and phytoplankton present in the system. Farmers monitor the ponds plankton profile and *Vibrio* count. Fish mucus and faeces could be important factors in the growth of the probiotic bacteria that could have affected both the water quality, other water microflora and shrimp resistance to diseases. Cost benefit analysis of farms using the greenwater system vs non-greenwater showed that the former might give better income, which can explain the extension of its application in the Philippines.

In this review, the beneficial effects, the mechanisms, and the challenges in the use of the greenwater culture system will be discussed.