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POND DYNAMICS/AQUACULTURE COLLABORATIVE RESEARCH SUPPORT PROGRAM



RESEARCH REPORTS

SUSTAINABLE AQUACULTURE FOR A SECURE FUTURE

Title: A water budget model for pond aquaculture

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Date: November 6, 1998 **Publication Number:** CRSP Research Report 98-126

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Abstract: A water budget simulation model that can be used for forecasting water requirements for aquaculture ponds has been developed. Water sources considered in the model include regulated inflow, precipitation and runoff, whereas water losses include evaporation, seepage, effluent discharge, and overflow. The model has been validated for ponds located at the Asian Institute of Technology (AIT), Thailand and at El Carao, Honduras which are, respectively, located in the humid and dry tropics. Simulation results indicate that precipitation accounted for 69.8% of the total water gains for the AIT and 43.2% for El Carao. Regulated inflow provided 27% of the gains for AIT and 52.8% for El Carao. Runoff gains were minimal at both locations due to small watershed areas. Evaporation accounted for 54.9 and 40.1% of the overall water loss predicted for the AIT and El Carao locations, with seepage accounting for the remaining loss. Predicted water requirements at AIT over a 5-month period exceeded actual amounts by 14.9%, apparently because seepage loss was over-estimated. For El Carao, however, predicted water requirements were only 78.2% of the amount actually added, apparently due to poor estimates of evaporative water loss which averaged 0.32 cm day⁻¹ compared to pan evaporative measurements of 0.43 cm day⁻¹. In contrast, the predicted evaporative water loss for the AIT pond (0.47 cm day⁻¹) closely matched pan evaporation measurements (0.45 cm day⁻¹). The availability of relative humidity and cloud cover data for AIT explain the higher accuracy in evaporative water loss estimates, and therefore water requirements, compared to El Carao. If comprehensive weather datasets are available, the water budget model developed herein is a useful tool for estimating pond water requirements at individual facilities located in different geographical regions.

This abstract was excerpted from the original paper, which was published in *Aquacultural Engineering*, 18(1998):175-188.

CRSP RESEARCH REPORTS are published as occasional papers by the Program Management Office, Pond Dynamics/Aquaculture Collaborative Research Support Program, Oregon State University, Snell Hall 400, Corvallis, Oregon 97331-1641 USA. The Pond Dynamics/Aquaculture CRSP is supported by the U.S. Agency for International Development under CRSP Grant No.: LAG-G-00-96-90015-00.