NOTICE OF PUBLICATION

AQUACULTURE COLLABORATIVE RESEARCH SUPPORT PROGRAM

RESEARCH REPORTS

Sustainable Aquaculture for a Secure Future

Title: **An organic matter and nitrogen dynamics model for the ecological analysis of integrated aquaculture/agriculture systems: II. Model evaluation and application**

Author(s): D. M. Jamu y R. H. Piedrahita, Department of Biological and Agricultural Engineering, University of California, One Shields Avenue, Davis, CA 95616, USA

Date: **October 1, 2002** Publication Number: CRSP Research Report **02-A4**

The CRSP will not be distributing this publication. Copies may be obtained by writing to the authors.

Abstract: The performance of a model developed to simulate organic matter and nitrogen dynamics in integrated aquaculture/ agriculture systems was evaluated using sensitivity analysis and model verification procedures with data from three sites. The model sensitivity analysis results were used to identify parameters that required high accuracy in measurement, and to suggest areas of future research in integrated aquaculture/agriculture systems. Model sensitivity analysis results showed that research on stocking density, sediment processes and water management practices was required, in order to improve the overall understanding of the functioning of the integrated aquaculture/agriculture system. Results from model verification runs showed that the model performance was satisfactory with respect to fish growth, crop growth, pond and terrestrial nitrogen and organic matter simulations. However, the modeling of phytoplankton biomass was less satisfactory and the results suggested the need for more site-specific calibration of exogenous factors and the consideration of phytoplankton species composition in simulating grazing preferences by fish. Application of the model to investigate the effects of different cycling pathways on nitrogen retention and productivity showed that the recycling of plant wastes to aquaculture ponds had a major effect in reducing system nitrogen losses and increasing system productivity. Sediment organic matter processes were identified as the major determinants of system nitrogen retention, as measured by the nitrogen retention index. The modeling study also showed that the number of linkages between the aquaculture and agriculture components was not directly related to nitrogen retention and productivity in the system. The results of the modeling study suggest that the system nitrogen status may be more important than the number of pathways

CRSP RESEARCH REPORTS are published as occasional papers by the Program Management Office, Aquaculture Collaborative Research Support Program, Oregon State University, 418 Snell Hall, Corvallis, Oregon 97331-1643 USA. The Aquaculture CRSP is supported by the US Agency for International Development under CRSP Grant No.: LAG-G-00-96-90015-00 and by collaborating institutions. See the website at <pdacrsp.orst.edu>.

Continued…

in determining the number and type of cycling pathways that should be incorporated in integrated aquaculture/agriculture system.

This abstract is excerpted from the original paper, which was in Environmental Modelling and Software, 17(6):571-582.

CRSP RESEARCH REPORTS are published as occasional papers by the Program Management Office, Aquaculture Collaborative Research Support Program, Oregon State University, 418 Snell Hall, Corvallis, Oregon 97331-1643 USA. The Aquaculture CRSP is supported by the US Agency for International Development under CRSP Grant No.: LAG-G-00-96-90015-00 and by collaborating institutions. See the website at <pdacrsp.orst.edu>.