

3.1 Summary of Research Activities

The *Continuation Plan 1996-2001* identified three areas of aquaculture production systems research that is further subdivided into research themes designed to address the factors constraining the development of sustainable aquaculture. The research outlined in the Eighth Work Plan includes nine of the 15 themes listed in the *Continuation Plan*. This report presents the past year's research on the following themes: pond dynamics, feeds and fertilizers, reproduction control, aquaculture systems modeling, marketing and economic analysis, adoption/diffusion, decision support systems, effluents and pollution, and new aquaculture systems and species.

Pond Dynamics studies included the continued development of a pond soil classification system that can be utilized across a diversity of sites. Additionally, the data collected to refine this delineation system for pond soils further contributes to the knowledge base regarding the chemical characteristics of soil profiles that can be used in developing a system of pond soil taxonomy used in traditional soil science.

Special Topics Research on feeds and fertilizers involved continued testing of the effects of feed protein content on the semi-intensive production of *Penaeus vannamei* in Honduras, the evaluation of supplementary diets for tilapia culture in North Vietnam, and the identification of low cost supplemental feeds for tilapia cage and pond culture in the Philippines.

Reproduction Control research focused on the development of androgenesis techniques for the monosex production of tilapia and the determination of the optimal treatment conditions for masculinizing Nile tilapia (*Oreochromis niloticus*) through immersion in 17 α -methyl-dihydrotestosterone.

Aquaculture Systems Modeling research was directed at enhancing an integrated aquaculture/agriculture model to include relationships between carbon input and sediment quality in aquaculture pond dynamics. Research also led to the development of an aquaculture pond model designed to analyze environmental impacts through the prediction of temperature and dissolved oxygen in stratified fish ponds. Special Topics Research produced two bioenergetics growth models—one that simulates Nile tilapia growth in an integrated culture system and another that incorporates limiting nutrients and standing crop in its simulations of tilapia growth.

Within the Marketing and Economic Analysis theme, a "safety first" model that explicitly addresses risk factors has been developed to analyze the integration of CRSP-developed pond fertilization schemes into Honduran shrimp and tilapia farming systems. Impact and welfare analysis models were also designed so that the social and economic returns attributable to PD/A CRSP technologies can be determined.

Adoption/Diffusion research involved the development of a qualitative study designed to trace the career and educational pathways of students, either directly or indirectly funded by the PD/A CRSP, to determine how students have affected the transfer of CRSP technological and financial resources.

Decision Support Systems (DSS) research lead to the improvement of the user interface of POND[®] software. In addition, POND[®] was refined to enable users to compare production efficiencies at different levels of fertilization and feeding with feed types of varying moisture, protein, and energy content.

Studies in Thailand and Honduras sought to address the impacts of effluents associated with tilapia and shrimp culture, respectively. At the Asian Institute of Technology researchers assessed the amount of nitrogen, phosphorus, and solids discharged from pond waters and evaluated five fish harvest techniques to determine which would most effectively reduce the loading of nutrients and solids in effluent waters.

Since 1993, the PD/A CRSP has participated in a collaborative effort with the Honduran government, local and international educational institutions, and Honduran shrimp farmers to monitor estuary and embayment water quality of the Gulf of Fonseca. Data collected can be used to detect improvements or declines in water quality, formulate and validate numerical estuarine models to predict future estuarine environmental conditions, and estimate estuary carrying capacity by combining farm chemical budgets and estuarine fluid dynamics. These efforts are ongoing.

In Peru, the need to evaluate the aquaculture potential of local and native species and develop appropriate culture technologies has been identified. Currently PD/A CRSP researchers are rearing *Piaractus brachypomus* to contribute to the limited production technology data existing regarding Peruvian aquaculture species and culture technologies.

Abstracts presented here also report on research results from the Interim Work Plan, which covered the period from 1 September 1995 to 31 July 1996, in addition to Special Topics Research. Interim Work Plan research included the continued testing of an integrated rotational aquaculture system designed in Thailand and Special Topics Research involved the development of two bioenergetics growth models.

The abstracts in the following chapter are divided into two major sections: Global Research and Regional Research. Global Research covers cross-cutting research, while the Regional Research section presents investigations, including Special Topics Research, conducted at each Host Country field site in Central America, South America, East Africa, and Southeast Asia. Full technical reports are published in the companion volume, the 15th Annual Technical Report. Copies can be ordered from the Program Management Office in Corvallis, Oregon.