

POND DYNAMICS/AQUACULTURE COLLABORATIVE RESEARCH SUPPORT PROGRAM

THIRD ADDENDUM TO THE EIGHTH WORK PLAN

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The *Eighth Work Plan*, published in Summer 1997, described a standardized set of experiments to be undertaken by the Collaborative Research Support Program in Pond Dynamics/Aquaculture during the period 1 August 1996 through 31 July 1998. An addendum containing official changes relating to schedules and/or methods to the work plans as described in the *Eighth Work Plan* was published in Spring 1998. A second addendum, printed in Spring 1999, contained changes to Eighth Work Plan activities implemented since the publication of the first addendum. This third addendum describes further changes implemented since the publication of the second addendum. Program activities are funded in part by Grant No. LAG-G-00-96-90015-00 from the United States Agency for International Development (USAID), Global Bureau, Office for Agriculture and Food Security. The authors' opinions expressed herein do not necessarily reflect the views of USAID.

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INTRODUCTION

The Pond Dynamics/Aquaculture Collaborative Research Support Program's framework consists of two building blocks: research in sustainable production systems and research support activities. The latter builds capacity through education, technology transfer, information management, and networking. The former attempts to remove constraints to the development of more sustainable aquaculture through research in three different areas: production optimization, environmental effects, and social and economic aspects. Each area is further subdivided into more specific research themes.

The *Third Addendum to the Eighth Work Plan* contains approved work plan revisions for Eighth Work Plan investigations and may be most useful when consulted in conjunction with the *Eighth Work Plan*, the *Addendum to the Eighth Work Plan*, and the *Second Addendum to the Eighth Work Plan*. The following report is divided into three sections: Section A contains revised experimental designs; Section B contains revised schedules; and Section C contains cancelled work plans. This is the final addendum to the Eighth Work Plan.

SECTION A: REVISED EXPERIMENTAL DESIGNS

REPRODUCTION CONTROL

Monosex Tilapia Production through Androgenesis: Methods for Strain Variation in Sex Ratio Inheritance

Reproduction Control Research 1A (8RCR1A)

Experimental Design Modification

The funded experiment proposed to evaluate five strains of *O. niloticus* for variation in sex ratio. The work plan has been changed to read: The variation in sex ratio of non-hormone-treated *Oreochromis niloticus* stocks from a minimum of three unique origins will be described.

Monosex Tilapia Production through Androgenesis: Methods for the Contribution from the Male and Female Genome to Sex Inheritance

Reproduction Control Research 1C (8RCR1C)

Experimental Design Modification

The experiment has been modified to utilize normal males and females in place of androgenetically produced males and females. Individual males will be mated with several females, and individual females mated with several males.

MARKETING AND ECONOMIC ANALYSIS

Economic and Social Returns to Technology and Investment

Marketing and Economic Analysis Research 1 (8MEAR1)

Experimental Design Modification

This work plan, as printed, included studies of economic and social returns of CRSP research in three countries (Honduras, Thailand, and the African site) over five years. The Eighth Work Plan portion examined the economic returns of CRSP research in Honduras only.

The original design of this study called for a welfare analysis approach to measure what economists term social welfare by measuring consumer and producer surplus econometrically from demand and supply estimation. However, it was not possible to gather data on a sufficiently large number of farms for a long enough time period to conduct accurate econometric analysis. An equally acceptable analytical approach to estimating returns to technology and investment is the nonparametric approach, which was instead chosen as the most appropriate given the available data. Social returns refer to the economic impacts on society of the adoption of a new technology. These returns are embedded in the results of the analysis, but with the nonparametric approach, it is not possible to separate out benefits to producers from benefits to consumers, as is done in a welfare analysis.

Risk Analysis of Pond Management Strategies

Marketing and Economic Analysis Research 2 (8MEAR2)

Experimental Design Modification

This investigation was to use cost and returns data from Thailand for fish and livestock production to construct a model of aquaculture production. The project was to model a typical farm and look at aquaculture, horticulture, and livestock alternatives, and to perform risk analyses using a Target MOTAD or a Mean-Gini model.

8MEAR2 was proposed in conjunction with 8MEAR1 as a five-year study. However, under the Eighth Work Plan, the investigation was reduced to a two-year study. It became clear during initial investigations that it would be more cost-effective to conduct 8MEAR1 and 8MEAR2 at the same site, and thus the first risk analysis was developed using data from Honduras. In Honduras, as in many other countries, there is no one typical farm and farm size often determines production and marketing strategies. Therefore, five different models were developed. Shrimp prices were used to look at effects of varying prices on the different farms modeled and on the different culture alternatives (production intensity, feeding, and fertilization alternatives) analyzed. Price sensitivity analyses were conducted to expand the research effort beyond the proposed analyses.

SECTION B: REVISED SCHEDULES

FEEDS AND FERTILIZERS

Global Experiment: Optimization of Nitrogen Fertilization Rate in Freshwater Tilapia Production Ponds

Feeds and Fertilizers Research 1 (8FFR1)

Philippines Research (8FFR1Ph)

Old Schedule

Cool Season Trial Start:	December 1999
Cool Season Trial End:	March 2000
Warm Season Trial Start:	May 1999
Warm Season Trial End:	August 1999
Final Report Due:	July 2000

New Schedule

Cool Season Trial Start:	November 1999
Cool Season Trial End:	February 2000
Warm Season Trial Start:	April 2000
Warm Season Trial End:	July 2000
Final Report Due:	July 2000

SECTION C: CANCELLED WORK PLANS

REPRODUCTION CONTROL

Monosex Tilapia Production through Androgenesis: Methods for Development of YY Lines of Male and Female *O. niloticus*

Reproduction Control Research 1D (8RCR1D)

8RCR1D has been cancelled. The completion of 8RCR1D was dependent on two factors: identifying the best tilapia strain to use for androgenesis and the development of androgenesis techniques that would produce sufficient numbers of viable animals to allow the establishment of YY brood populations. No strain evaluated in 8RCR1A had a high enough percentage of spawns conforming to a 50:50 sex ratio to justify its use in 8RCR1D. Lines of fish conforming to a 50:50 sex ratio inheritance will need to be established from single pair spawns, assuming that sex ratio is an inheritable trait. The heritability of sex ratios needs to be confirmed and is addressed as part of the Ninth Work Plan.

Techniques to produce YY males through androgenesis as part of 8RCR1B are in the development stage and are not ready to be scaled up to produce the large quantities of fish required for 8RCR1D. Results of 8RCR1B demonstrate the difficulty of producing androgenotes. Mortality is increased at three levels: 1) artificial propagation; 2) gamete treatment; and 3) increased homozygosity and androgenotes, increasing the lethal/detrimental genomic combinations. The spawning process to obtain viable tilapia eggs is problematic; only 2.4% of the androgenetically treated eggs hatched, with 0.9% of the treated eggs yielding viable fry to swimup. Refinements of both spawning and androgenesis techniques are needed before adequate numbers of YY fry will be available for estrogen feminization. Finally, the proposed estrogenic treatment would add yet another layer of mortality. This proposed feminization of a genetically inferior progeny group of YY males is not achievable at the present time.

KENYA RESEARCH

Strain Variations in Sex Ratio Inheritance

Kenya Research 2 (8KR2)

8KR2 has been cancelled. This study was undertaken in support of another Eighth Work Plan study, 8RCR1. The intent was to conduct a minimum of 50 pair spawns using pure *Oreochromis niloticus vulcani* from Sagana Fish Farm, obtain a minimum of 100 fry from each, and determine the sex ratios of those progeny. Over 50 pair spawns were conducted at Sagana during 1997 and 1998, but there was such poor survival of the 5-cm size fry that no set of progeny contained the required minimum of 100 fry. In mid-1998 it was determined that the strain of tilapia being cultured at Sagana was not a pure population of *O. niloticus vulcani*, but rather a mix of *O. niloticus vulcani* and *O. spirulis*. It was determined that continuing to conduct pair spawns with contaminated strains of tilapia was of little value.