Global Experiment Central Database:

The World's Largest Inventory of Standardized Pond Aquaculture Data

Introduction

Between 1982 and 1989, the Pond Dynamics/Aquaculture Collaborative Research Support Program (PD/A CRSP) conducted a standardized pond aquaculture experiment at tropical field sites (Global Experiment, or GE), resulting in a database with over one million ground-truthed observations of pond-related variables in six countries (Honduras, Indonesia, Panama, Philippines, Rwanda, and Thailand).

Rwanda

The goal of the GE was to quantitatively describe the physical, chemical and biological principles of fish pond culture systems. Data were collected using standardized methods and equipment at all sites, resulting in a robust dataset suitable for extensive analysis. The focus was on freshwater pond aquaculture, where the fish species, Nile tilapia (*Oreochromis niloticus*), was held constant between experimental sites, although two sites included brackish-water data and other culture species.

Taal Lake, Philippines

The database was housed in two data storage locations, but unfortunately there were systems failures at both sites. We are now in the process of reconstituting and verifying the dataset to make publicly available the value and continued applicability of the Global Experiment Central Database, which remains, to our knowledge, the largest of its kind in the world. Continued data analysis with modern tools and techniques could offer wide-ranging applications for aquaculture researchers in developing countries and elsewhere around the world.

Products of the Global Experiment

Data collected between 1982 and 1989 (phase one) of the GE went through quality control and assurance protocols before being entered and housed in an extensive online database in a primary site at Oregon State University. A mirror location at the Asian Institute of Technology in Thailand was established in the mid-1990's.

When the host site was fully functional, users were able to query the Central Database and view the data in raw and summary forms, and in graphic and tabular formats. Datasets were searched and retrieved based on geographic location, fish culture method and species, and data type (including weather, water quality, pond soil management schedules for water, fertilizers, and fish feeds, and fish production)

Decision Support Systems and Expert Systems

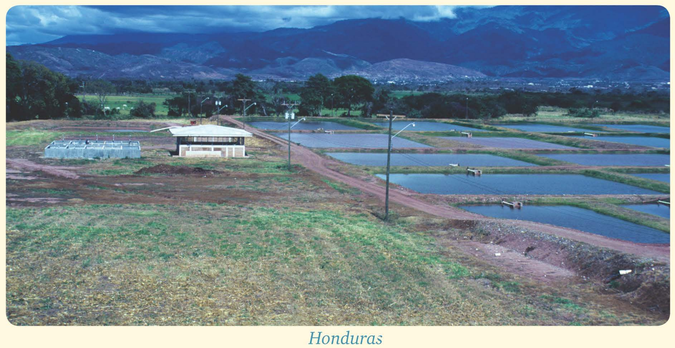
Powerful analytical tools, called Decision Support Systems (DSS), were developed using the global experiment database to help rapidly assess the individual pond-level or facility-level performance of aquaculture systems under different management regimes.

Aquaculturists, researchers, extension agents, educators, producers, farmers, and students used some of these DSS tools (such as the POND© Software developed by the PD/A CRSP) to explore planning and management options, along with the biological, chemical, physical, and economic variables relevant to the optimization of pond production.

All experimental ponds were sited within +/- 15 degrees of the equator. A minimum of 12 earthen ponds were used for each research site, and consisted of two separate grow-out cycles for the dry season and the wet season, each lasting 150 days.

For example, users could conduct multiple simulations to examine the effects of management scenarios, including:

- varied stocking densities and combinations of species,
- specific stocking and harvest dates of individual populations,
- feed and fertilization schedules, and
- water balance and flow-through pond facilities.



Honduras

POND© Software

The POND© software analyzes pond systems through hierarchically organized simulation and progressively more complex models. POND© contains an economics package for generating pond facility enterprise budgets. It also includes a parameter estimation package which can compare multiple simulation runs with user-provided fish growth data, arriving at "best-fit" parameters to customize the software to specific culture conditions, sites, and species.

Additionally, the software featured highly configurable, user-friendly interfaces to:

- define new ponds and new populations associated with specific ponds
- develop feed schedules and fertilization recommendations to more efficiently attain specified fish target weights
- conduct facility-level simulations at a site
- present simulation results in graphical and tabular formats.

Tragic Loss

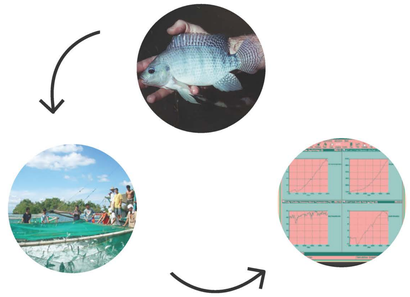
The primary host site of the database experienced a catastrophic failure in the early 2000's due to computer storage issues at OSU, and much of the dataset was lost. However, a mirror at the Asian Institute of Technology that provided backup hosting was able to help recover much of that dataset, which is now being reconstituted and readied for launching on the AquaFish website.

Methods

Led by Oregon State University, in collaboration with US and Host-Country institutions, the GE was intended to determine how best to optimize productivity in a fish culture pond using fertilization and careful water quality management to reach carrying capacity and maximize fish yields.

The technical goal of the GE was to quantitatively describe the physical, chemical, and biological principles of pond culture systems. By conducting standardized experiments in multiple sites throughout the world, it was possible to distinguish between site-specific factors and more universal factors that can be considered general principles in any pond aquaculture system.

The primary culture organism used in the experiments, the Nile tilapia (*Oreochromis niloticus*) was held constant for each freshwater research site. Weather stations were set up to measure and record local climatological events at each site, including temperature, wind speed and direction, rainfall, and solar irradiance. Locally-available feeds in-country were also evaluated. Data from pond measurements were collected by researchers in host countries and sent to database managers at Oregon State University.



The experiments were designed to test the working hypothesis that combinations of organic and inorganic fertilization will improve water quality and will produce higher fish yields. Fertilizer treatments included the application of chicken litter or other locally available animal and plant wastes at the rate of approximately 500 kg/hectare/week.

A second treatment was applied using inorganic fertilizers in the form of triple-super phosphate (0-46-0) and urea was added at levels of total P and N equivalent to the levels of total P and N in the organic fertilizer from the first treatment.

Discussion

The enduring legacy of the Global Experiment database is apparent in the unprecedented wealth of verified data points collected using a standardized method across all sites for an extended period of time.

This dataset represents a significant contribution to the science of pond aquaculture, and has applications and relevancy to many pond aquaculture science and research efforts ongoing today.

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AQUAFISH INNOVATION LAB

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The Feed the Future Innovation Lab for Collaborative Research on Aquaculture & Fisheries

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