

Poling Aquaculture Inc
Final Report
Northeast Region, Sustainable Agriculture Research and Education
Program.

Grant Application, FNE 95-83
Towards Aquaculture.
Klee Dugan, Project Leader
3/95 - 11/98

Funding Award: \$3,936.00

Matching Share: \$2,905.00

Restatement of Project Goals:

1. To - extend and prolong our aquaculture production season
2. To - integrate recirculating tanks into small unit aquaculture
3. To - Compare and evaluate aquaculture systems and techniques, related to small unit aquaculture. (Ponds, Cages, Recirculating Tanks)
4. To - modify new technologies and alter them to suit the climatic conditions of our region.
5. To - demonstrate and introduce new aquaculture techniques into small unit fish farming.
6. To - share and disseminate our findings to other aquaculturist and interested persons.
7. To - operate an open site for the observation and demonstration of small unit aquaculture.

Since 1994, we have been involved in the monoculture and development of the brown bullhead. This fish is affectionally known throughout all of New England as the horned pout. (*Italurus Nebulosus*)

Historical Background, FNE 95-83
SARE Report

Our farm received its grant in March of 1995, that summer, our farm along with the entire region suffered a severe unanticipated drought. Many of the surface water sources that had traditionally provided us dried up. Due to this situation, we lost many of our broodstock. A large number of our free swim stock also died. At that time it became necessary for us to utilize our on hand financial resources to explore and dig for water.

We requested of Mr Fred Magdoff, SARE Program Coordinator, that we be granted a extension of time to fulfill our goals and objectives. Our request was approved.

(See request and approval letters)

Throughout 1996 - 97, we were into a recovery mode. In our planning process, we had never even considered drought. In January of 96, the New Hampshire Fish and Game Department allowed us to recover wild catch from public waters. Throughout that summer and into the fall we dug wells and worked to domesticate our newly captured fish.

(See General Planning Process & Capture Permit RSA 206:9)

By the fall of 97, we had completed the majority of our new infrastructure. Three new wells, Patricks Well, 550 feet - Daniels well, 475 feet, and a surface water containment well 25 feet, a utility shed complete with electrical service, and a new pond. Our domestication of our wild catch was very successful, and by the end of summer, we had sufficient numbers of both broodfish and spawn. During our recovery, we never lost sight of our stated program goals.

We had not requested any SARE program funds during our recovery period. The reasons for our long delay in beginning our project are as follows..

A; Unanticipated Weather.

B; More Detailed Planning. (Infrastructure)

C; Reestablishment of Participant Cost Share.

D; Time to Domesticate Wild Fish.

2. Updated Farm Information:

Our farm is located in the township of Deering, New Hampshire. We are on Fisher, Rd. (Poling Farm - Midhills) It is situated in the saddle of Clarks Summit, between Wolf and Gove Mountains. The headwaters of the north branch of the Piscataquog River begins here.

At the beginning of our project we were involved with the farming of free swimming fish in two ponds. We had about 30 pair of broodstock and about 500 free swimmers. All of our ponds were supported by surface water sources.

We now have five operational ponds and well over 10,000 free swim fish. The farm now has two major wells tapped into large aquifers and a surface water containment well.

We now operate seven holding cages, three of them can support up to 300lbs of fish. Two of them can support up to 150lbs, the other two are used for medication and backup.

We now operate two 750 gal recirculating tanks with solar season-extending domes with bio filtration.

We have a 10 x 10 utility shed with electrical service and a gas powered 3/4 hp generator.

We have 250 broodstock pairs and many three year individual fish suitable for brooding.

3. Project Cooperators:

- A; Klee Dugan, Project Leader, Mrs Dugan coordinated the direction and overall activities of Towards Aquaculture. She also worked daily in the project.
- B; Dr Daniel Poling, Landowner, Grange Member, age 90. Dr Poling provided the knowledge and experience of over 70 years of water utilization techniques. He also provided daily labor.
- C; Melvin Murrel, Farm Manager, Vice President N. H Aquaculture Assoc. Mr Murrel ran the day to day activities of the fish farm. he provided daily labor, conducted tours and workshops. He also coordinated with all outside support agencies and individuals.
- D; Jay Hendee, State Biologist, Mr Hendee did all water quality testing and general pathology. He monitored fish health and provided diagnostic services.
- E; Dr Joseph Buttner, Researcher, SUNY Brockport, Dr Buttner provided the protocol methods and techniques - **Caged Culture of Bullhead fishes, New York Sea grant Extension and Great Lakes Research Consortium. # 910-201-19.** Dr Buttner also provided consultation.
- F; Christine Dugan, Naturalist, Mrs Dugan worked in our planning process and provided environmental requirements towards sustainability. She also provided labor during harvest and some weekends.
- H; Robert Mc' Calister, Retired, Grange member, Mr Mc'Calister did the natural dowsing for aquifers, 70 % accuracy.
- I; James Lewis, Professional Diver, Mr Lewis provided pond survey maps and fish habitat observation. (**Horned Pout, bottom dwellers**)
- J; Brian Doyle, UNH Cooperative Extension. Mr Doyle provided technical assistance and support with other agencies.

4. What was done in Project

We operate an open site for the observation and demonstration of lay research and native species development.

Day to day activites consist of feeding, monitoring, water quality testing, general management, systems operation and a wide variety of small tasks. (See Project Schedule)

We have explored a variety of culture techniques, systems and approaches. We are using the protocol methods developed for bullhead fishes by the State University of New York, (SUNY)

Researching the Benefits of Recirculating Tanks:

Traditional aquaculture, (Ponds) requires vast quantities of water. In the construction of our second fish pond, we measured the input volume to be around 250,000 to 300,000 gallons. Yearly at least half that amount is lost due to seepage and evaporation.

By employing recirculating tanks, we benefit in the following ways.

1. We are able to extend and prolong our growing season
2. We can better see and monitor our stock
3. We can warm water faster for optimal growing tempertures
4. We use less water and land.

We designed our systems similar to those used by the Alternative Aquaculture Association. We used 750 gallon portable production tanks with koi pond bio filters. We modeled our solar enclosers on a design from the booklet called, **Fish Farming in Vermont - The Extension Service and the School of Natural Resources, University of Vermont. (Page 31)**

The tank introduction will allow for us to begin operation about two to three weeks earlier. They will allow for us to extend our season by about another two weeks on the end.

4. What was done in Project, Con't

Lay ~~Ichthyological~~ Knowledge
Ichthyological

Our project was able to combine the tested scientific protocols of University researchers with the knowledge and experiences of older farmers. Some of these farmers had been farming fish in ponds for over 50 years. We worked with Grange members to record and put into practice some of the techniques they had developed.

We built our pond siphon system and our gravity flow system utilizing these ⁱⁿ knowledge. We explored for water using a method of dowsing called free sticking. They taught us how to create spawn nesting sites using a system of old cleaned out tires and number 10 cans.

Domestication of Wild Catch

We obtained our fingerlings by capturing wild, gravid female pout. We were able to do this with the cooperation of the State Fish and Game Dept. They issued us a scientific research permit and allowed us to search for fish in public waters throughout the State.

We did not have the expertise, nor were there any studies to assist us in the breeding characteristics of pout. The National Catfish Growers Assoc. supplied some data on the genetics of catfish reproduction. We made spawning nests as instructed by Grange members and this proved to be successful.

(Catfish and Bullhead members of the same Family - Icturidae)

We used cages to maintain, observe, evaluate newly captured fish. It also gave us the opportunity orientate them to formulated feeds. We found that we achieved better growth rates from floating trout food than sinking catfish food.

(See feeds and feeding rates)

5. Findings and Accomplishments

Findings Fish (Horned Pout)

- A; The steps necessary for wild fish domestication.
- B; Feeds and feeding rates for stages of development.
- C; Stocking densities in different culture systems - ponds, cages, tanks.
- D; Intervention practices and related fish health.
- E; Water quality and quantities in culture systems.

Accomplishments Fish

- A; Domestication, - orientation to formulated feeds.
 - stress reduction in transfer.
 - spawning techniques.

Findings Systems (pond, cages, tanks 750 gal)

- A; Systems tolerances and requirements.
- B; Cost effectiveness.
- C; Amounts of labor per system
- D; Modification to suit climatic conditions

Accomplishments Systems

- A; Ponds - increased flow rates and support systems (Wells)
- B; Cages - increased protections and placement, stocking capabilities.
- C; Tanks - increased seasonal production

Unexpected Results

We did experience some unexpected results related to our different systems and rearing techniques. Free swimming fish in ponds grew at the same rate of caged fish. Caged fish gained more weight than free swimmers fed equally. Fish can be over-wintered in cages. Solar domed tanks need supplemental heating in late fall. Wood framed cages using pressure treated lumber is questionable. (fish health issue)

6. Relevant Site Info.

All of our ponds and water sources are located in a upland position. With no abutters our water quality and flow rates are unpaired. At 1,000 feet, we experience extreme temperture fluctuations within the four seasons. Our ability to out siphon is enhanced by our upland positioning. By maintaining wildlife habitat near all our operational ponds, (Beaver lodges, Duck Boxes, Deer Runs) plus hiking trails and unaltered wet lands. We have won community support for our project.

7. Economic Findings.

Granted our funding from SARE in 1995, Spending it along with our recoverd match in 1998. We found that prices for the supplies we listed in the grant application had gone up by 20 percent or more. Permit fee's and electric rates have also gone up. Prices paided for fish used in pond stocking is down and land taxes are up. As our production rate increases, so do the cost. We have found that there is hardly any room for the small unit fish farmer in the world of aquaculture research funding.

8. New Ideas

We have and are continuing to explore alternative energy sources. We would like to also try to be a supplier of aquaculture materials at some time in the future. We are trying to built a co-op within our state association.

9. Continued Uses of Investigated Practices.

We are still process of testing the value of our solor domes and recirculating tanks. We have not yet determined the full ecomonic's associated. We are still working out our management plans related to health issues and stocking. We will continue to share our results with SARE.

10. What We Tell Others.

We are the only farm within our state association that is doing aqua - research. So we share a lot of information (the about project and aquaculture in general. We have a copy of the National Aquaculture Development Plan and we are the only small unit fish farm that has received any type of funding.(SARE) We explain what we are trying to accomplish with alternative energy sources. We encourage others to join the state aquaculture association. We give instruction on how to put together some of our low tech systems for high quality results.

11. Outreach Efforts.

As stated before, we are a open site for the demonstration of small unit fish farming. We have hosted workshops and given presentations. We have co-sponsored outreach activities with Cooperative Extension, the Grange, University of New Hampshire and N.H Aquaculture Association. We have given tours to Church groups, Veterans groups, School and University students. We are on the Board of Directors of the New Hampshire Technical College, Aquaculture Education Program. Melvin Murrel our farm manager is the vice president of the N.H. Aquaculture Association and a delegate to the Northeast Regional Aquaculture Summit. We have a display at the Farm and Forest Expo, and have articles written in a number of Newspapers.

(See Attached Articles - Concord Monitor - State Agriculture News-
The Deering Connection - The Villager -
Cooperative Extension Twilight Tours.