TAA
Trade Adjustment Assistance for Farmers
Technical Assistance
Risk Management for Catfish Farmers
Understanding Risk Management

Jimmy L. Avery, Ph.D.
Extension Aquaculture Leader and Extension Professor
National Warmwater Aquaculture Center

Risk Management

- Risk management is defined as the organized treatment of loss exposures.

- The premise is that losses can be managed by using planning and precaution.
Steps to Risk Management

1. Identify the loss exposures.
2. Select techniques to address the loss exposures.
3. Implement the techniques chosen.
4. Monitor the plan and update as needed.

Identifying Loss Exposures

- Any of the situations that present a chance of loss in your business.
- These may or may not happen but the first step is to identify the possibilities.
Loss Example: Hatchery

- Injury to visitor
- Building Fire
- Loss of fry

Elements of Loss

- Subject of Loss
  - Building, fish, visitor
- Cause of Loss
  - Fire, virus, wet floor
- Financial Consequences
  - Cost to rebuild
  - Loss of sales
  - Legal action
Obvious Exposures

- Buildings and Equipment
- Fish
- Natural Disasters
- Rising input costs
- Employee Injuries

Buildings and Equipment

- Fire
- Severe Weather
  - Tornadoes
  - Hurricanes
- Theft
Transport

- Liability exposure
- Loss of fish in transit
- Replacement costs
- Employee injuries

Disease Loss

- Columnaris
- ESC
- Aeromonas
- Winter Kill
- PGD
- VTC
- Anemia
- Trematodes
- Brown blood
Disease Loss

• Fry to 5-inch fingerlings = 20 to 35%
• 5-inch fingerlings to harvest size = 18 to 24%
• 2010 NAHMS survey may give better estimate

Off-Flavor

• Delays harvest and restocking
• Adds cost to production
• Potential negative impact on market
• Possible mortality during delay
  – Diseases
  – Low DO levels
Bird Predation

• American White Pelican
  – 200 birds eat $3,000 of fish / day
  – Trematode cost could reach $45 million

• DC Cormorants
  – $25 million in losses

• Heron and Egrets
  – Impacts feeding of fingerlings
  – Masks diseases

Harvesting

• Stress on fish
• Aeration failure
• Sock collapse
• Theft
• Employee injury
Natural Disasters

- Prolonged high temperatures
- Droughts
- Hurricanes
- Ice storms
- Floods

Loss of Power

- Short term
- Long term
- Back up availability
- Response time
- Just as critical in hatchery
Feed Cost

- Feed costs increased by $150/ton (66%) from 2005 to 2008
- 2011??

Non-Obvious Exposures

- Equipment leases
- Borrowed equipment
- Injuries to independent contractor
Ways to Treat a Loss Exposure

• Avoid the risk
  – Not always practical
Ways to Treat a Loss Exposure

• Avoid the risk
• Transfer the risk
  – Insurance
  – Contract language

Ways to Treat a Loss Exposure

• Avoid the risk
• Transfer the risk
• Retain the risk
  – Take a risk
  – Accept the consequences
Ways to Treat a Loss Exposure

• Avoid the risk
• Transfer the risk
• Retain the risk
• Control the risk
  — Prevention (chloride addition)
  — Reduction (backup generators)

Implement Techniques

• Implementation becomes the risk management techniques
• All parts must move toward the preservation of the company’s assets.
Monitor and Update

• Review and revise as circumstances change.

Summary

1. Identify the loss exposures.
2. Select techniques to address the loss exposures.
3. Implement the techniques chosen.
4. Monitor the plan and update as needed.
Thank You!!

Questions??
Assessing and Reducing Production Costs for a Healthy Enterprise

John Michael Riley
Commodity Marketing Specialist
Department of Agricultural Economics

Assessment Needs

• To properly assess your operation RECORD KEEPING is a must!
• Why keep thorough records?
  – Useful management tools
    • Can quickly and easily show strengths/weaknesses of your operation
  – Tax reporting
    • Helps to streamline income tax preparation
  – Obtaining credit
    • Provides useful information that creditors often seek when making loan decisions
Characteristics of Good Record Keeping

• Keep records...
  ...Simple
    • Creating a complex system will only lead you to abandon it
  ...Current
    • Timely information is critical
    • Waiting until tax time (etc) does you no good in evaluating your operation
  ...Appropriate for the operation
    • Make sure the records you keep assist you in making management decisions

What IS Needed to Create Records?

• Receipts
  – If it is bought or sold you should have a receipt
  – Keep them and put them to use
• Inventories
  – Know how many of everything you have on hand
• Production information
Putting the Information to Use

• Break Even Analysis –
  – B.E. Price = \frac{\text{Expected Total Costs}}{\text{Expected Yield}}
  – B.E. Yield = \frac{\text{Expected Total Costs}}{\text{Expected Price}}

• Break Even Analysis –
• Rearranging these gives:
  – B.E. Total Costs = \frac{\text{Expected Yield}}{\text{Expected Price}}
Costs of Production

- Feed
- Interest
- Fingerlings
- Labor - Hired
- Labor - Mgmt
- Fuel - Diesel
- Transportation
- Fuel - Gasoline
- Elec - Aeration
- Elec - Meter
- Elec - Pumping
- Repairs & Maintenance
- Bird Chasing
- Misc.

Interest: 57.7%
Costs of Production

• Feed costs account for bulk of production costs
  – By targeting feed costs savings can be achieved
• Soybean Meal and Corn make up the majority of feed ingredient costs
  – SBM → approx. 30-50% of feed ingredients
  – Corn → approx. 30-35% of feed ingredients

SBM and Corn: Price Perspective
SBM and Corn: Price Perspective

SBM and Corn: Volatility

- Commodity prices have become increasingly volatile since 2007
- Protection from violent price swings can help stabilize costs ...
  ... and thus income
SBM and Corn: Volatility

 Costs Reduction

- Knowing your break-even costs, prices and/or yield provide a target when procuring feed
- Use available risk management tools to reduce volatility (and possibly costs)
- “Lock-In” costs when prices are “too good to pass up”
  - Futures markets exists for SBM and Corn
  - Forward contract with your feed distributor
Locking-In Feed Prices

- Know today that you will need to purchase 300 tons of feed in six months
- Feed = about 35% SBM
- 300 tons feed = approx. 105 tons SBM
- SBM futures contract equals 100 tons of SBM
- TODAY buy 1 SBM futures contract
- When you purchase your feed in six months, sell 1 SBM futures contract

SBM Cash and Futures Relationship
Summary

• Keeping thorough records will provide valuable information on production costs and incomes
• This will assist in determining opportunities for costs reduction
• When available utilize options to lock-in profitable cost savings

Thank You & Questions

John Michael Riley
662.325.7986
Riley@agecon.msstate.edu
Partial Budget Analysis

• Summarizes all of the cost and return items that would be expected to change in a new/revised production system

• Includes 4 elements
  – Increased costs
  – Decreased revenues
  – Increased revenues
  – Decreased costs

Partial Budget Analysis

• **Increased Costs**
  – Labor/Management

• **Decreased Revenues**
  – ???

• **Increased Revenues**
  – Weaning weights
  – Calving %

• **Decreased Costs**
  – Lower Feed
The Split-Pond:
A new pond-based production system for catfish

Defining loading limits of static ponds for catfish aquaculture

John A. Hargreaves a,1,*, Craig S. Tucker b

a Department of Wildlife and Fisheries, Mississippi State University, Box 1069, Mississippi State, MS 39762-1069, USA
b Medgar Evers National Warmwater Aquaculture Center, Mississippi State University, P.O. Box 197, Stoneville, MS 38868, USA

Abstract
Commercial channel catfish farming has emerged as the most important aquaculture industry in the United States. During the last two decades, industry growth has occurred by expansion in the number and area of facilities and through production intensification.
Unmanageable factors limiting catfish production

Waste treatment capacity

Ammonia accumulates to toxic levels when fish are fed large amounts of feed
limits production to 30,000 pounds/acre

Water temperatures in Mississippi

Limited growing season
Fish grow slower in cold water
limits production to 20,000 pounds/acre
Unmanageable factors limiting catfish production

Waste treatment capacity (30,000 pounds/acre)

Water temperatures in Mississippi (20,000 pounds/acre)

Using ponds for inventory storage

Need for 12-month processing means that some pond space is used to hold fish rather than grow fish

limits production to 15,000 pounds/acre

John A. Hargreaves a,1,*, Craig S. Tucker b

a Department of Wildlife and Fisheries, Mississippi State University, Box 9960, Mississippi State, MS 39762-9960, USA
b Mississippi State University, P.O. Box 197, Stonewall, MS 38776, USA

Abstract

Commercial channel catfish farming has emerged as the most important aquaculture industry in the United States. During the last two decades, industry growth has occurred by expansion in the number and area of facilities and through production intensification. Evidence suggests that catfish farming has apparently reached the limits of the production system as currently configured. The success of commercial catfish culture can be attributed in part to low production costs resulting from the inherent waste assimilation capacity of aquaculture ponds, although operating within this capacity is complex and associated with several poorly defined limitations and hidden costs. Loading limits for pond aquaculture are based on the waste assimilation capacity of ponds and tolerance limits of the cultured species. The important design and operational considerations affecting loading limits include temperature effects, oxygen requirements, fish water quality tolerance limits, organic matter decomposition, and nutrient removal. Engineering solutions for extending the loading limits of pond aquaculture must account for the highly dynamic and complex nature of the pond.
Inefficiencies in traditional ponds

Oxygen production and waste removal

Fish +
Oxygen production +
Waste removal

Oxygen production and waste removal are driven by solar energy

Solar energy is free, but diffuse, requiring a large energy-collection area

So, fish roam around in much more space than they need (only about 5% of the pond is needed for “living space”)

Results of system inefficiencies

Difficult to maintain optimum oxygen levels
- most of the available oxygen is used up by bloom, mud, and other crud
- aerator oxygen is diluted by a huge volume of oxygen-deficient water

Feeding (fish scattered over large area)
Disease treatment (treatments are diluted)
Harvest (must seine large areas to capture relatively few fish)
Predator control
Results of system inefficiencies

Difficult to maintain optimum oxygen levels
- most of the available oxygen is used up by
  bloom, mud, and other crud
- aerator oxygen is diluted by a huge volume of
  oxygen-deficient water

Feeding (fish scattered over large area)
Disease treatment (therapeutic treatments are diluted)
Harvest (must seine large areas to capture relatively few fish)
Predator control
Fish + Oxygen production + Waste removal

Oxygen production + Waste removal

Fish

Oxygen pumped in

Wastes flushed out

Oxygen production + Waste removal
The “split-pond” system

Drain —— deepen this end —— Well

Drain —— to form this levee —— Well

Waste-treatment area (70-80% of total area)

Slow-turning paddlewheel pump

Fish-holding area (15-20%)

Fish barriers
**Daytime:**
- Circulator on
  - Oxygen produced in photosynthesis on big side pulled into fish-holding side
  - Wastes swept from fish side and treated on big side

**Nighttime:**
- Circulator off
- Aerator on
  - Fish are now isolated in a small area where they can be aerated effectively. Big side? Who cares?

Note that aerators and circulator never run at same time.
Daytime:
• Circulator on
  - Oxygen produced in photosynthesis on big side pulled into fish-holding side
  - Wastes swept from fish side and treated on big side

Nighttime:
• Circulator off
• Aerator on
  - Fish are now isolated in a small area where they can be aerated effectively.
  - Big side? Not aerated. Who cares?

Note that aerators and circulator never run at same time

Split-pond fish production, 0.9-acre pond

All studies used stockers of 100 to 130 lb/1000 fish, single batch, April stocking and Oct-Nov harvest, fed 28% protein commercial feed

<table>
<thead>
<tr>
<th>Fish</th>
<th>Rate</th>
<th>Yield (lb/A)</th>
<th>Harv wt</th>
<th>FCR</th>
<th>Survival</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC</td>
<td>10,000</td>
<td>&lt;0</td>
<td>dead</td>
<td>infinite</td>
<td>&lt;0</td>
</tr>
<tr>
<td>Hyb</td>
<td>15,000</td>
<td>14,000</td>
<td>~2.0</td>
<td>&gt;5</td>
<td>50%</td>
</tr>
<tr>
<td>Hyb</td>
<td>10,000</td>
<td>17,000</td>
<td>1.7 lb</td>
<td>1.87</td>
<td>99%</td>
</tr>
<tr>
<td>Hyb</td>
<td>12,500</td>
<td>21,000</td>
<td>2.0 lb</td>
<td>1.78</td>
<td>85%</td>
</tr>
<tr>
<td>Hyb</td>
<td>12,500</td>
<td>22,000</td>
<td>1.8 lb</td>
<td>1.80</td>
<td>97%</td>
</tr>
<tr>
<td>Hyb</td>
<td>12,500</td>
<td>18,000</td>
<td>1.6 lb</td>
<td>1.80</td>
<td>96%</td>
</tr>
<tr>
<td>Hyb</td>
<td>10,000</td>
<td>19,000</td>
<td>2.0 lb</td>
<td>1.83</td>
<td>95%</td>
</tr>
</tbody>
</table>
Keys to proper design

1. Oxygen supply is first limiting factor, well before waste treatment capacity

2. Dissolved oxygen supply must be adequate at all times to maintain a non-limiting dissolved oxygen concentration

3. Source of oxygen differs depending on time of day
   
   **Daytime:** oxygen pumped from big side

   **Nighttime:** mechanical aeration
Design criteria

1. Daytime pumping rate must deliver enough oxygenated water from big side to meet oxygen consumption rate of fish on small side

2. Nighttime mechanical aeration on small side must transfer enough oxygen to meet oxygen consumption rate of fish

Estimated Daytime Pumping Rate

(or, how big must paddlewheel be and how fast should it turn)

DO pumped in during day = O₂ use by fish

(\(\text{DO in water}) \times \text{(pumping rate)} = \text{O₂ use by fish}\)

or

\[\text{pumping rate} = \frac{\text{O₂ use by fish}}{(\text{DO in water})}\]

\(\text{PR (gpm)} = \frac{\text{maximum pounds fish (0.8)}}{(\text{lowest desired DO})}\)
Required pumping rate for Stoneville 4.5-acre split pond

Maximum pounds = 90,000
Lowest desired DO = 5 ppm

PR = maximum pounds fish (0.8) ÷ (lowest desired DO)

PR = (80,000)(0.8) ÷ (5)

PR = 12,800 gallons/min

Measured and projected water flows
10, 12, and 15-foot wide paddles, 3.5 feet immersion
Water flow, 5-hp gearmotor, 12-foot wide paddle, 3.5 feet immersion

Actual: 12,000 GPM
Projected: 4,000 GPM
Estimated Nighttime Aeration

(or, how many horsepower of paddlewheel aeration is required)

Aerator SAE = pounds O₂ / hp • hour
Aerator FAE = (correction factor)(SAE)

O₂ use by fish = (FAE of aerator)(horsepower), or
Horsepower = (O₂ use by fish) ÷ (FAE of aerator)

Horsepower = (maximum pounds of fish) (0.0002)
Calculated aerator requirement for 4.5-acre split pond

Maximum pounds of fish = 80,000 pounds of fish

Horsepower = (maximum pounds of fish) (0.0002)

Horsepower = (80,000)(0.0002)

Horsepower = 16

So, two, 10-hp paddlewheel aerators were used
Operating Conditions

Circulator: On only when DO > 4.0 ppm
Aerator 1: On only when DO < 4.0 ppm
Aerator 2: On only when DO < 3.0 ppm
2009 biweekly average dissolved oxygen, dawn

Dissolved oxygen (ppm)

No-fish side

Fish side

6 am noon 6 pm midnight 6 am noon
6-acre conventional pond

1-acre “fish end” of split pond

4.5-acre split-pond, 2009

Stocked in April
45,000 hybrid catfish (10,000 per acre)
119 lb/1000

Fed daily with 28% protein "commercial" feed
Harvested last week in October
4.5-acre split-pond, 2009

Feeding days = 202

Feed

total = 131,500 pounds (~15 tons/acre)
daily average = 145 pounds/acre per day
July-Sept = 215 pounds/acre per day

Production

total = 77,000 pounds
per acre = 17,100 pounds/acre

Average fish weight = 1.8 pounds
Survival = 98%
Feed conversion ratio = 1.83
4.5-acre split-pond, 2009

Feeding days = 202

Feed

total = 131,500 pounds (~15 tons/acre)
daily average = 145 pounds/acre per day
July-Sept = 215 pounds/acre per day

Production

total = 77,000 pounds
per acre = 17,100 pounds/acre

Average fish weight = 1.8 pounds
Survival = 98%
Feed conversion ratio = 1.83
Some version of the PAS approach is the best way to achieve high per-area fish production using algae-based aquaculture.

The simple “split-pond” appears to be the easiest PAS variation to build and use for catfish.

The “commercial-sized” scale-up was successful.

Unresolved issues:

- PGD is still a high risk.
- Unknown economics relative to traditional ponds.
- Best suited for single-cropping.

Average fish weight = 1.75 pounds
% of fish by weight > 1.25 pounds = 94%
% of fish by weight > 1.50 pounds = 84%
Some version of the PAS approach is the best way to achieve high per-area fish production using algae-based aquaculture.

The simple “split-pond” appears to be the easiest PAS variation to build and use for catfish.

The “commercial-sized” scale-up was successful.

Unresolved issues:
- PGD is still a high risk
- Unknown economics relative to traditional ponds
- Best suited for single-cropping
Some version of the PAS approach is the best way to achieve high per-area fish production using algae-based aquaculture.

The simple “split-pond” appears to be the easiest PAS variation to build and use for catfish.

The “commercial-sized” scale-up was successful.

Unresolved issues:

- PGD is still a high risk
- Unknown economics relative to traditional ponds
- Best suited for single-cropping
- Potential over-wintering problems

Next steps

Look at longer-term performance and over-wintering.

Scale-up

8-acre system is being constructed
size of paddlewheel pump may be the limiting factor

Reduce cost of system
lightweight, modular paddlewheel has been fabricated
new sluiceway designs under consideration