

AQUACULTURE 101; MIDWEST SEAFOOD PRODUCTION

- 1) Economic Overview
- 2) Feeding, Biogain and Biomass



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Typical investment, yield and cash-flow

Low-yield prawn to super-intensive marine shrimp

<u>System</u>	<u>Yield</u>	<u>Water Treatment</u>
Freshwater Prawns	400-800 lbs/200-days	dilution/pond assimilation
In-Pond Raceway Sunfish	1,500- 2,000 lbs/200 days	dilution/pond assimilation
Recirculating Bass	12,000 lbs/200-days	high-rate biofilter
Zero-Discharge Marine Shrimp	25-35,000 lbs/ac-120-days	super-intensive biofloc

<u>System</u>	<u>Investment</u>	<u>Cash-flow</u>
Freshwater Prawns	~\$10,000/acre	\$4,000 – \$8,000/acre-yr
In-Pond Raceway	~ \$12,000/unit	\$9,000 – \$12,000/yr
Recirculating Bass	~ \$100,000/unit	\$72,000/yr
Zero-Discharge Marine Shrimp	~ \$1.6 million/acre	\$1,000,000/yr

Feed application is the driver of aquaculture production

In theory, feed consumption can be predicted by equations and charts; Below; Predicted catfish feed consumption and FCR (conversion rate = amount of feed per unit of fish gained)

<i>Fish size (lbs./1000 fish)</i>	<i>Feed consumption (% body weight)</i>	<i>Feed conversion ratio</i>
60	4.0 - 4.5	1.1 - 1.2
100	3.5 - 4.0	1.3 - 1.4
300	2.5 - 3.0	1.4 - 1.6
600	2.0 - 2.5	1.6 - 1.8
750	1.5 - 2.0	1.8 - 1.9
1,000	1.3 - 1.5	1.9 - 2.0
2,000	1.1 - 1.2	2.0 - 2.2
3,000	1.0 - 1.1	2.2 - 2.4

Example; Fish-Feed, Biogain and Biomass prediction

Predicted Feed = Biomass(day-1) x feed rate per day

2,000 lbs biomass x 2.0% per day = 40 lbs feed/day

Biogain = 40 lbs feed / 1.5 lbs feed per lb of gain (FCR) = 26.6
lbs of fish production

Fish biomass (day-2) = (2,000 lbs + 26.6 lbs) – mortality =
2,020.6 lb biomass

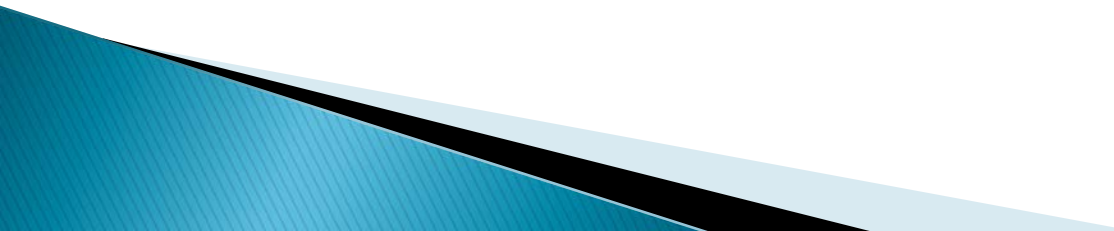
Representative marine shrimp feed application and biomass over 120 day grow-out cycle

Day	Feeding Type	Survival Rate (%)	Size (gm)	Total Biomass (kg)	Feeding Rate % of	Feed Allotment for 10 days (kg)	Cumulative (kg)	FCR
PL ₁₅		100	0.02			7.0		
1-10	F ₁	88	0.55	48.47	7.0	33.88	33.88	0.70
11-20	F ₁	83	1.30	107.90	5.0	53.95	78.83	0.81
21-30	F ₁	80	2.88	230.40	5.0	115.20	203.03	0.88
31-40	F ₂	77	5.25	404.25	4.0	161.70	364.73	0.90
41-50	F ₂	74	8.05	595.70	4.0	238.28	603.01	1.01
51-60	F ₂	72	11.80	849.60	3.0	254.88	857.89	1.01
61-70	F ₃	70	15.85	1109.50	3.0	332.85	1190.74	1.07
71-80	F ₃	68	20.10	1366.80	2.5	341.70	1532.44	1.18
81-90	F ₃	67	24.50	1641.50	2.0	410.38	1942.82	1.19
91-100	F ₄	66	29.65	1956.90	2.5	391.38	2334.20	1.30
101-110	F ₄	65	32.60	2119.00	2.0	423.80	2758.00	1.41
111-120	F ₄	65	35.00	2275.00	2.0	455.00	3213.00	1.41

In actual practice, feed uptake is impacted by water quality, temperature, and fish-health

Fish/shrimp are fed to satiation by observing feeding behavior (floating/surface feeds for most fish and sinking/bottom feeds for most shrimp)

Daily feed uptake is recorded; biogain and accumulated biomass is estimated from expected % feed uptake and animal FCR



Catfish feeding observations / behavior

Actual feed application adjusted for uptake

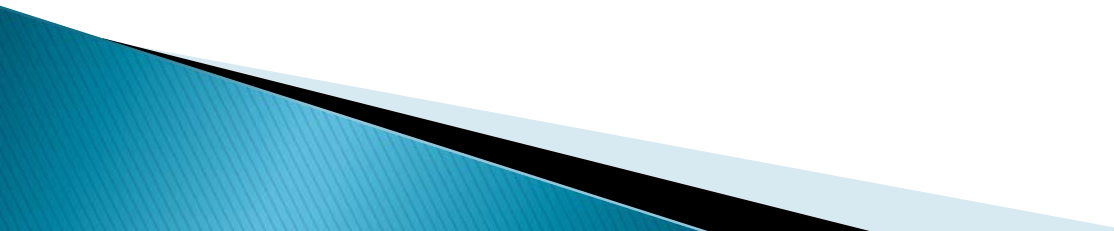


Shrimp bottom feeding;

- 1) Sweep bottom with net; access to bottom required
- 2) Observe feed uptake on suspended trays; labor-intensive, multiple trays required for accuracy



Observations of feeding behavior is important

- 1) Feeding behavior = best indicator of animal health
 - 2) Managing feed application is critical, as feed is major operational cost and most significant impact upon water quality
 - 3) Accurately representing feed uptake = best estimator of daily animal biogain and total biomass in system
 - 4) Example feed suppliers; Cargill, Purina, Rangen, Ziegler
 - 5) Typical feed price; 32%-45% protein = \$0.60 – \$1/00/lb
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TUESDAY, JULY 11

9:00-9:30 AQUACULTURE FEEDING AND ECONOMIC SUMMARY

9:30-10:00 OVERVIEW OF AQUACULTURE

10:00-10:30 WATER QUALITY FOR AQUACULTURE

10:30-10:15 BREAK

10:15-10:45 FRESHWATER PRAWN PRODUCTION

10:45- 11: 15 FRESHWATER PRAWNS AT BRADFORD FARMS

11:15 – 12:00 WATER QUALITY MEASUREMENT TECHNIQUES

12:00 – 1:00 LUNCH

1:00-1:45 AQUACULTURE INTENSIFICATION; PAS, SPLIT PONDS,
FLOATING RACEWAYS, RAS

1:45- 2:30 BIOFLOC AQUACULTURE

2:30- 2:45 BREAK

2:45-3:45 TOUR PRAWN PONDS AND ZERO DISCHARGE SHRIMP SYSTEM

3:45- 4:00 QUESTIONS & DISCUSSION

5:00- 6:00 DINNER AT BRADFORD FARM

WEDNESDAY JULY 12

9:00 – 10:30 BUS TO HIGGENSVILLE MO

10:30 – 12:00 TOUR OF ELLIS DIECKOFF RECIRCULATING SYSTEM

12:00-1:00 BOX LUNCH

1:00 – 2:30 BUS TO MU BRADFORD FARMS

2:30-3:00 BREAK

3:00 – 3:45 DISCUSSION OF AQUACULTURE ECONOMICS

3:45- 4:00 COURSE EVALUATION/FEEDBACK