

Growth Performance of Tilapia in Earthen Ponds Using the ASA Feed-Based Technology with Soy Maximized Feed

Results of ASA/Soy-in-Aquaculture 2003 Feeding Demonstration

Lukas Manomaitis and Michael C. Cremer
American Soybean Association
12125 Woodcrest Executive Drive, Suite 100
St. Louis, MO 63141 USA

ABSTRACT

A feeding demonstration was conducted at Tampa Bay Tilapia Farm, Santa Rita, Pampanga, Philippines to demonstrate the growth of tilapia (*Oreochromis niloticus*) using ASA feed-based culture methodologies and soy-based feeds. Mono-sexed tilapia of size 0.5 g were stocked in three, 0.63-ha ponds at 31,656 fish per hectare. Tilapia grew from an average of 0.5 g to 251 g in 98 days and yielded an average of 6,531 kg/ha. An economic analysis of the project indicated a 49.5% overall return on investment (ROI) for the farmer from the three combined ponds.

ASA SIA FY03 PHILIPPINE DEMONSTRATION PROJECT

INTRODUCTION

The American Soybean Association (ASA), under the Soy-in-Aquaculture Program and in cooperation with Tampa Bay Tilapia Farm at Santa Rita, Pampanga, Philippines, conducted a 98-day feeding demonstration with mono-sexed tilapia in earthen ponds. The objective of the project was to demonstrate the improved economic return of culturing tilapia using the ASA feed-based production methodology with extruded, soy-maximized aquafeeds.

MATERIALS AND METHODS

Three ponds of an average size of 0.63-ha at Tampa Bay Tilapia Farm at Santa Rita, Pampanga, Philippines, were used for the demonstration. All ponds were dried prior to use and the bottom organic layers scraped away and removed prior to filling. Each pond was filled using borehole water. Preparation for the ponds was according to the ASA 80:20 manual “Principles and Practices of 80:20 Pond Fish Farming”.

Mono-sexed, male tilapia fingerlings of about size 0.5 g were produced at the Philnor Aqua Inc. hatchery in San Miguel, Quezon, Philippines. Tilapia were stocked in the three ponds at a density of 31,656 fish per ha. Fish in all ponds were of uniform size and age at stocking. Production targets were 250 g per fish, or 7,500 kg/ha after a predicted 5% mortality.

Tilapia were fed 2-3 times daily with an extruded, floating feed formulated to contain 36% crude protein and 7% crude lipid (36/7) for fish under 50 g average size (Tables 1 and 3). A second feed formulated to contain 32% crude protein and 6% crude lipid (32/6) was fed to fish ≥ 50 g average size (Tables 2 and 3). These feeds were formulated by ASA to maximize soybean meal use, and contained either 46% (36/7) or 53% (32/6) dehulled soybean meal as a percentage of total feed ingredients. These feeds were produced domestically in the Philippines by I.O. Basic Feedmill in Angeles City. The three ponds were treated as replicates of a single feed treatment, with fish in all ponds fed in an identical fashion at each feeding using the ASA satiation feeding technique.

Pond management was based on the ASA 80:20 pond production model. Fish in all ponds were sampled once per month on about the same date each month. At the conclusion of the demonstration, all ponds were completely harvested and all fish enumerated and weighed. Results were used to determine fish survival, average fish weight, gross fish production and feed conversion ratio (FCR).

All expenses related to pond use and management were recorded by the farmer. At the conclusion of the project the ASA team and the farmer used this information to create a financial analysis of the pond project.

The following costs were recorded and used for this financial analysis:

- All labor costs
- Land rental costs
- Liming cost

ASA SIA FY03 PHILIPPINE DEMONSTRATION PROJECT

- Fingerling cost
- Pumping costs
- Aeration cost
- Feed costs
- Harvest costs

RESULTS

Tilapia were fed an average of 98 days between 16 May and 22 Aug 2003 (Table 4). Tilapia grew from an average of 0.5 g to 251 g in this period and yielded an average production of 6,531 kg/ha for the three ponds (Figure 1; Table 4). Average survival rate was 82% and average FCR was 1.13:1 (Table 4; Figure 2).

Average economic return for this demonstration was positive, with an average return on investment (ROI) of 49.5% (Table 5).

SUMMARY AND CONCLUSIONS

This was the first demonstration of its type in the Philippines and was very successful in demonstrating the results that can be achieved with the ASA feed-based pond system. Prior to this demonstration Tampa Bay Tilapia Farm was using a significantly higher stocking rate (over 75,000 fish/ha) which resulted in a lower survival rate and higher FCR (estimated from other ponds at 55% and 1.55:1 respectively). Water exchange, through the use of diesel engine-pumped borehole water, was normally used to improve water quality during times of oxygen stress. The time to grow the fish to target weight took about four and a half months with the locally used protocols. The estimated ROI from this traditional system was about 19%.

Through this demonstration the cooperating farmer was able to see the benefits of using a lower stocking density and the ASA feed-based pond technology. The primary benefits were a faster production rate, higher survival, lower FCR, less water exchange and larger ROI. This allows the farmer to more effectively use the ponds with lower capital outlay and increased profitability.

The protocol for this demonstration mandated that the farmer install and use an emergency aeration system. Unfortunately the system was not installed until the later stages of the demonstration or fish survivals may have been higher. A follow-on demonstration at another site with comparison ponds using the locally used production techniques and in which the demonstration protocols and feeding techniques are adjusted from this year's experience is recommended to further demonstrate the production and economic advantages of the ASA feed-based technology and soy-maximized fish feed.

ACKNOWLEDGEMENTS

The ASA Soy-in-Aquaculture Program gratefully acknowledges the local ASA Philippines office for their help and support of this demonstration project.

ASA SIA FY03 PHILIPPINE DEMONSTRATION PROJECT

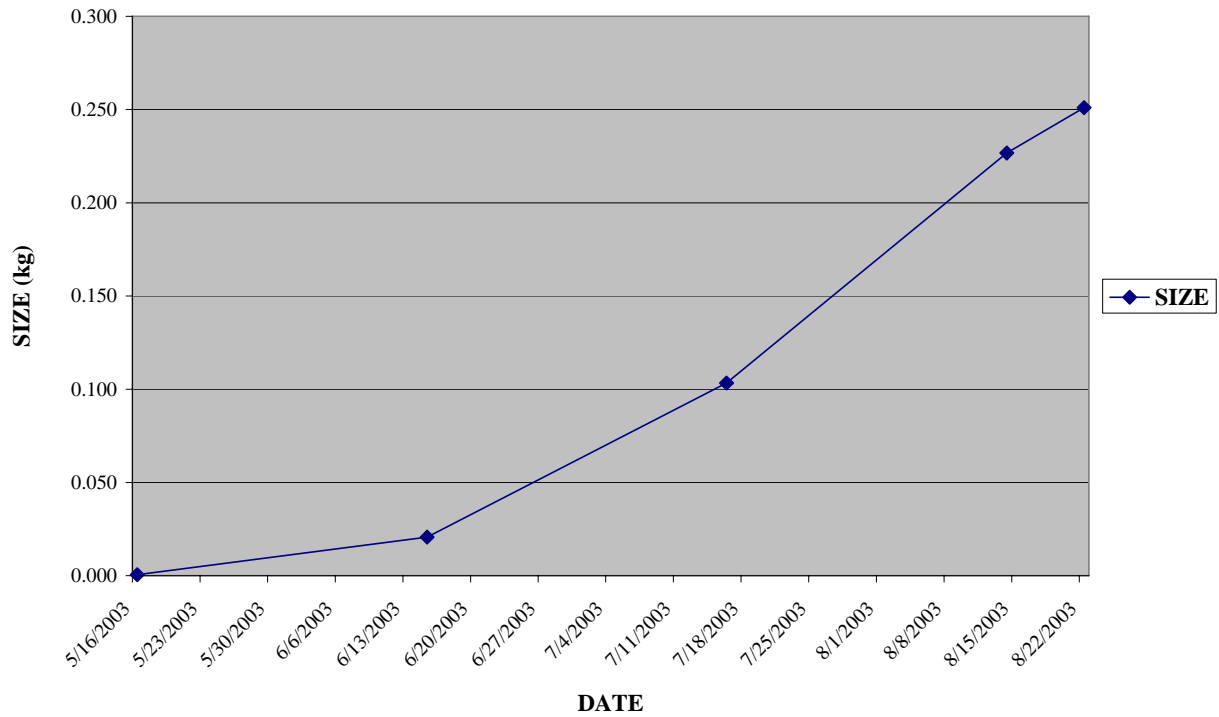


FIGURE 1. Growth curve for tilapia grown in earthen ponds using the ASA feed-based production methodology and soy-based feeds during a 98-day culture period in the 2003 ASA SIA Tilapia Demonstration Project at the Tampa Bay Tilapia Farm in Santa Rita, Philippines. Tilapia grew from an average of 0.5 g to 251 g in 98 days.

ASA SIA FY03 PHILIPPINE DEMONSTRATION PROJECT

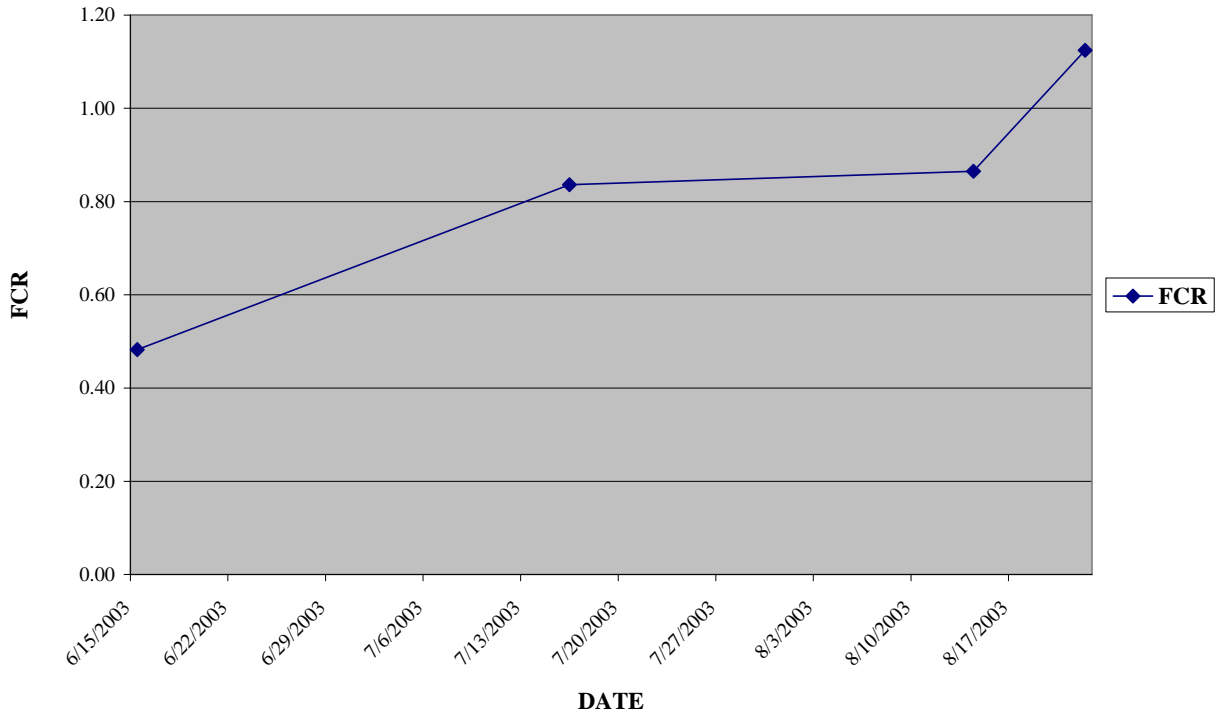


FIGURE 2. FCR curve for tilapia grown in earthen ponds using the ASA feed-based production methodology during a 98-day culture period in the 2003 ASA SIA Tilapia Demonstration Project at the Tampa Bay Tilapia Farm in Santa Rita, Pampanga, Philippines. Average FCR with the soy-based feeds was 1.13:1.

ASA SIA FY03 PHILIPPINE DEMONSTRATION PROJECT

TABLE 1. Formula provided to I.O. Basic Feedmill for the ASA 36/7, soymeal-based feed used in the 2003 ASA SIA Tilapia Demonstration Project at the Tampa Bay Tilapia Farm in Santa Rita, Pampanga, Philippines. The feed was fed in a crumble and 2-mm size.

36/7¹ Fingerling Feed*
2003 Philippine Tilapia Feeding Demonstrations

Ingredient	% Inclusion Rate
Soybean Meal 47.5%	46.00
Wheat, SWW	19.00
Wheat middlings	8.00
Corn Gluten Meal 60%	10.00
Fishmeal, Anchovy 65/10	8.00
Fish Oil, Unspec.	4.23
Soy lecithin	1.50
Ca Phosphate Mono	2.20
Vit PMX F-2	0.75
Min PMX F-1	0.25
Stay C 35%	0.05
Ethoxyquin	0.02
TOTAL	100.00

*For fingerling fish weighing between 0.5 grams and 50 grams

¹The numerical component of the feed description refers to the percentage of protein and fat, respectively, in the ration, i.e. 36/7 indicates 36% crude protein and 7% crude fat.

ASA SIA FY03 PHILIPPINE DEMONSTRATION PROJECT

TABLE 2. Formula provided to I.O. Basic Feedmill for the ASA 32/6, soymeal-based feed used in the 2003 ASA SIA Tilapia Demonstration Project at the Tampa Bay Tilapia Farm in Santa Rita, Pampanga, Philippines. The feed was fed in 3-mm and 4-mm pellet sizes.

32/6¹ Growout Aquafeed*
2003 Philippine Tilapia Feeding Demonstrations

Ingredient	% Inclusion Rate
Soybean Meal 47.5%	52.80
Wheat, SWW	23.20
Wheat middlings	10.00
Corn Gluten Meal 60%	6.00
Fish Oil, Unspec.	3.50
Soy lecithin	1.00
Ca Phosphate Mono	2.70
Vit PMX F-2	0.50
Min PMX F-1	0.25
Stay C 35%	0.03
Ethoxyquin	0.02
TOTAL	100.00

*For fish ≥ 50 g

¹The numerical component of the feed description refers to the percentage of protein and fat, respectively, in the ration, i.e. 32/6 indicates 32% crude protein and 6% crude fat.

ASA SIA FY03 PHILIPPINE DEMONSTRATION PROJECT

TABLE 3. Vitamin and mineral premix formulas provided to I.O. Basic Feedmill for the ASA 32/6 and 36/7 soymeal-based feeds used in the 2003 ASA SIA Tilapia Demonstration Project at the Tampa Bay Tilapia Farm in Santa Rita, Pampanga, Philippines.

Vitamin Premix PMX-F2¹

Nutrient	Unit	As fed
Vitamin A	IU/kg	1200000
Vitamin D3	IU/kg	200000
Vitamin E	IU/kg	20000
Biotin	mg/kg	40
Folic acid	mg/kg	1800
Niacin	mg/kg	40000
Pantothenate	mg/kg	20000
Pyridoxine (B6)	mg/kg	5000
Riboflavin (B2)	mg/kg	8000
Thiamin (B1)	mg/kg	8000
Vitamin B12	mcg/kg	2000
Ethoxyquin	mg/kg	500

Mineral Premix PMX-F1¹

Nutrient	Unit	As fed
Iron	ppm	40000
Manganese	ppm	10000
Copper	ppm	4000
Zinc	ppm	40000
Iodine	ppm	1800
Cobalt	ppm	20
Selenium	ppm	200

¹Premix ingredient quantities are per kg of premix.

ASA SIA FY04 THE PHILIPPINES DEMONSTRATION PROJECT

TABLE 4. Results of the 2003 ASA SIA Tilapia Demonstration Project at the Tampa Bay Tilapia Farm in Santa Rita, Pampanga, Philippines, that demonstrated growth performance of tilapia using the ASA feed-based production methodology and soy-based feeds.

Pond No.	Pond size	Stocking size (g) of tilapia	Stocking rate (fish/ha)	No. days fed	Harvest weight (g)	Gross Production (kg/ha)	Survival (%)	FCR
1	0.54	0.5	31,657	98	249	5,874	75	1.17
2	0.63	0.6	31,652	97	246	7,044	90	1.14
3	0.72	0.5	31,657	98	258	6,675	82	1.07
Mean	0.63	0.5	31,656	98	251	6,531	82	1.13

ASA SIA FY04 THE PHILIPPINES DEMONSTRATION PROJECT

TABLE 5. Economics of the 2003 ASA SIA Tilapia Demonstration Project in the Philippines that demonstrated growth performance of mono-sex tilapia in ponds using the ASA feed-based production methodology and soy-based feeds.

<u>Item</u>	<u>Basis</u>	<u>Pond 1</u>	<u>Pond 2</u>	<u>Pond 3</u>	<u>Totals</u>
<u>Fish Sales</u>					
Final biomass	kg	3,172.00	4,438.00	4,806.00	12,416.00
Sales price	Php/kg	43.00	43.00	43.00	
Gross income	Php	136,396.00	190,834.00	206,658.00	533,888.00
<u>Production Costs</u>					
Fry	Php	7,120.09	8,306.04	9,493.45	24,919.58
Feed	Php	64,094.45	86,648.29	88,050.75	238,793.49
Pond rent	Php	7,291.67	7,291.67	7,291.67	21,875.01
Pumping	Php	11,000.00	11,000.00	11,000.00	33,000.00
Lime	Php	326.67	326.67	326.67	980.01
Aeration	Php	400.00	400.00	400.00	1,200.00
Labor	Php	6,416.67	6,416.67	6,416.67	19,250.01
Harvest	Php	4,386.00	6,149.00	6,665.00	17,200.00
Total costs	Php	101,035.55	126,538.34	129,644.21	357,218.10
Net profit	Php	35,360.45	64,295.66	77,013.79	176,669.90
ROI					49.5%