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# **Guangzhou Pond Feeding Trial Demonstrates Channel Catfish Fingerling Production with Soy-Based Feeds**

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## **INTRODUCTION**

A feeding trial was conducted cooperatively by the American Soybean Association International Marketing (ASA-IM) program and the Guangdong Provincial Fishery Extension Center to demonstrate feed-based production of channel catfish fingerlings using the ASA-IM 80:20 pond technology and soy-based feeds. The demonstration trial was conducted at the Nanhai Keda Hengsheng Fishery Company Ltd. fish farm near Guangzhou, Guangdong Province, China.

## **FEEDING TRIAL PROTOCOLS**

Three, 5-mu (0.33-ha) ponds were used in the feeding trial to demonstrate feed-based production of channel catfish fingerlings. Channel catfish were stocked in the trial ponds at a density of 8,000 fry per mu (120,000/ha), together with 200 silver carp fingerlings per mu (3,000/ha). Mean weights of the channel catfish and silver carp at stocking were 0.2 g and 50 g, respectively. Catfish fry were stocked in the ponds on 1 July 2006, followed by stocking of silver carp fingerlings on 10 July 2006. The catfish were fed for 132 days with the ASA-IM 36/7<sup>1</sup> feed. The ASA-IM feed was least-cost formulated and was a primarily plant protein ration that incorporated soybean meal as the primary source of protein (Tables 1-3). Channel catfish were fed the 36/7 feed from approximately 1 g in size until harvest. Initial feed pellet size for the 36/7 feed was 1.5 mm. Channel catfish were fed to satiation twice daily, with fish in the three trial ponds receiving the same amount of feed at each feeding. All feed was fed in extruded, floating pellet form.

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<sup>1</sup>The 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.

Data on fish survival, gross and net production, average fish weight, and feed conversion efficiency were obtained at harvest for fish in each pond. All fish from each pond were weighed at harvest and sub-samples from each pond counted to get the average fish weight for each species in each pond population. Data on production input costs was recorded throughout the trial to determine the economic return with the ASA-IM feed and technology.

## **FEEDING TRIAL RESULTS**

Channel catfish growth, survival and feed conversion efficiency were highly variable in the three trial ponds. Catfish grew from 0.2 g to average weights of 53.5 g, 72.1 g and 96.7 in ponds 1, 2 and 3, respectively (Table 4). Mean catfish fingerling weight at harvest averaged 69.4 g for the three ponds. The 96.7 g average fish weight from pond 3 was the result of low catfish survival, with only 44.6% of the catfish in pond 3 surviving to harvest. Catfish survival rates in ponds 1 and 2 were 90% and 84.5%, respectively. Fish production at harvest averaged 406 kg/mu (6,090 kg/ha) for channel catfish and 77 kg/mu (1,155 kg/ha) for silver carp for the three trial ponds (Table 4). Channel catfish and silver carp represented 84% and 16%, respectively, of the total harvested fish biomass of 483 kg/mu (7,248 kg/ha). Average weight of silver carp from the three trial ponds at harvest was 433 g. The average survival rate for silver carp was 89.7%.

Channel catfish in the 15-mu (1.0-ha) of trial ponds were fed a total of 448.3 kg of feed per mu (6,725 kg/ha) over the 132-day trial. The feed yielded net catfish growth of 404 kg per mu (6,063 kg/ha) at an average feed conversion ratio (FCR) of 1.13:1 for the three trial ponds. FCR was 1.17:1, 0.92:1 and 1.31:1 for ponds 1, 2 and 3, respectively.

The trial yielded an average net economic return of RMB 1,515 per mu (\$2,877/ha) for the 15-mu of trial ponds. Market values for harvested fish were RMB 0.90 (\$0.11) per fingerling for catfish and RMB 4 (\$0.51) per kg for silver carp (Table 4). Return on investment (ROI) varied from -3.4% to 84%. ROI was 51.4% for the three ponds averaged together.

## **SUMMARY AND CONCLUSIONS**

Fish growth, feed conversion efficiency and economic return were all good in this demonstration trial, although all of the production parameters had an unusually high degree of variability among the three trial ponds. Catfish survival in pond 3 was especially low at 44.6%, with high fish losses reported to have occurred in late October. Sampling data for pond 3, however, indicates that catfish in this pond were significantly larger than catfish in ponds 1 and 2 from August onward, and suggests that fish losses in pond 3 may have begun to occur as early as mid-summer. While catfish exhibited superior growth in pond 3 in response to fewer fish, growing to nearly 97 g, the net effect of the low fish survival was a significant economic loss. Catfish fingerlings were valued by the individual, rather than by fish weight, so the net effect of low fish survival in pond 3 was a nearly 50% reduction in the net profit for the trial. The average net profit from ponds 1 and 2 with 85-90% fish survival was RMB 2,900/mu. When the loss from pond

3 was averaged in, net profit for the 15-mu of ponds dropped to RMB 1,515/mu. The reason for the low fish survival in pond 3 was not determined.

### **ACKNOWLEDGEMENTS**

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Table 1. Formula for the ASA-IM 36/7, soy-based feed used in the 2006 channel catfish fingerling trial in Guangzhou, Guangdong Province, China. The feed was produced as a least-cost formulation by Techbank Feed Mill, Shanghai, under supervision of ASA-IM. The feed was fed in extruded, floating pellet form. Feed batch formulations may have varied slightly during the trial period depending on specific ingredient nutrient profiles and ingredient availability.

Ingredient	Percent of total
Soybean Meal 46%	43.50
Wheat Middlings 14%	14.00
Fish Meal 65/8	13.00
Wheat Flour 11%	12.00
Corn Gluten Meal 60%	5.00
DDGS 27/10	5.00
Fish Oil, Unspec.	2.50
Ca Phosphate Mono 21%	1.69
Soy Lecithin	1.50
Soy Oil	1.00
Vit PMX F-2	0.50
Min PMX F-1	0.25
Stay C 35%	0.03
Ethoxyquin, SQ mixture 6	0.02
Choline Chloride 60%	0.01
TOTAL	100.00

Table 2. Calculated nutritional profile of the ASA-IM 36/7, soy-based feed used in the 2006 channel catfish fingerling trial in Guangzhou, Guangdong Province, China. The feed was produced in extruded, floating pellet form.

Nutrient	Value, As Fed
DE Fish (extruded)	2871.61
Starch	17.98
Protein, crude	36.14
Protein, digestible	33.55
Fish Protein	8.45
Soy Protein	20.01
Fat	6.96
W-3 (omega 3 fatty acid)	1.02
W-6 (omega 6 fatty acid)	1.62
Fiber	3.22
Ash	6.86
Calcium	0.92
Phosphorus, available	0.70
Choline	2497.61
Vitamin C	105.00
Ethoxyquin	134.50
Arginine	2.19
Isoleucine	1.77
Lysine	2.12
Methionine	0.68
Methionine + Cystine	1.20

Table 3. Vitamin and mineral premix formulations used in the ASA-IM 36/7 soy-based feed. Quantities of vitamins and minerals are per kilogram of premix.

Ingredient	Unit	Amount
<u>Vitamin Premix F-2</u>		
Vitamin A	IU/kg	1,200,000
Vitamin D3	IU/kg	200,000
Vitamin E	IU/kg	20,000
Vitamin K	mg/kg	0
Vitamin C	mg/kg	0
Biotin	mg/kg	40
Choline	mg/kg	0
Folic Acid	mg/kg	1,800
Inositol	mg/kg	0
Niacin	mg/kg	40,000
Pantothenate	mg/kg	20,000
Pyridoxine (B6)	mg/kg	5,000
Riboflavin (B2)	mg/kg	8,000
Thiamin (B1)	mg/kg	8,000
Vitamin B12	mcg/kg	2,000
Ethoxyquin	mg/kg	500
<u>Mineral Premix F-1</u>		
Iron	ppm	40,000
Manganese	ppm	10,000
Copper	ppm	4,000
Zinc	ppm	40,000
Iodine	ppm	1,800
Cobalt	ppm	20
Selenium	ppm	200

Table 4. Results of the 2006 ASA-IM aquaculture trial in Guangzhou that demonstrated growth performance of channel catfish fingerlings using the ASA 80:20 pond production model and a soy-based feed fed in extruded, floating pellet form.

Pond No.	ChC <sup>1</sup> stocking size (g)	Stocking rate (fish/mu)	No. days fed	Harvest wt. (g)		P <sub>G</sub> <sup>3</sup> (kg/mu)		Survival (%)		FCR	Net income (RMB/mu) <sup>4</sup>	ROI (%)
				ChC	SiC <sup>2</sup>	ChC	SiC	ChC	SiC			
1	0.2	8,000	132	53.5	400	385.3	72	90.0	90	1.17	3,091	84.0
2	0.2	8,000	132	72.1	400	487.3	75	84.5	94	0.92	2,708	73.6
3	0.2	8,000	132	96.7	500	344.8	85	44.6	85	1.31	-1,255	- 3.4
Mean	0.2	8,000	132	69.4	433	405.8	77	73.0	90	1.13	1,515	51.4

<sup>1</sup>CoC = Channel catfish

<sup>2</sup>SiC = Silver Carp

<sup>3</sup>P<sub>G</sub> = Gross Production

<sup>4</sup>RMB exchange rate: RMB 7.9 = \$1.00