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

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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 from fingerling to market size using the ASA-IM 80:20 pond technology and soy-based feed. The demonstration trial was conducted at the Nanhai Keda Hengsheng Fishery Company Ltd. fish farm near Guangzhou, Guangdong Province, China. It was the second year of a sequential two-year ASA-IM demonstration trial to show the value of soy-based feeds for growing channel catfish from fry to market.

## **FEEDING TRIAL PROTOCOLS**

Three, 5-mu (0.33-ha) ponds were used in the trial to demonstrate feed-based production of channel catfish. Channel catfish were stocked in the trial ponds at a density of 700 fish per mu (10,500/ha), together with 100 silver carp per mu (1,500/ha). Mean weights of the channel catfish and silver carp at stocking were 91 g and 250 g, respectively. Catfish were stocked in the trial ponds on 7 April 2007, followed by stocking of silver carp on 6 May 2007.

Feeding of the channel catfish was initiated on 10 May 2007 and was continued for 157 days. Catfish were fed the ASA-IM 32/6<sup>1</sup> feed in extruded, floating pellet form. 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, 2 and 3). Channel catfish were fed to satiation twice daily, using the ASA-IM 90% satiation technique, with fish in the three trial ponds receiving the same amount of feed at each feeding. All feed was produced by the Ningbo Techbank Feed Mill in Ningbo, Zhejiang Province, China, based on the formulation provided by ASA-IM.

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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. 32/6 indicates 32% crude protein and 6% crude fat.

Fish were sampled at approximately 30-day intervals during the course of the trial to monitor growth and fish health. 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 were harvested on 14 October 2007. Channel catfish grew from a mean stocking weight of 91 g to an average weight of 700 g in 157 days of feeding (Table 4). The average catfish biomass at harvest was 475.7 kg/mu ((7,136 kg/ha) and represented 77% of the total harvest biomass of 617.5 kg/mu (9,263 kg/ha). Silver carp biomass averaged 141.8 kg/mu (2,217 kg/ha) and represented 23% of the total harvest biomass. Catfish and silver carp survival rates averaged 97% and 90%, respectively, for the three trial ponds.

A total of 8,334 kg of feed was fed to the channel catfish in the three trial ponds. The feed yielded net catfish growth of 6,180 kg and resulted in an average feed conversion ratio (FCR) of 1.36:1 for the three trial ponds. There was substantial variation in the FCR for the three ponds, ranging from a low of 1.18:1 to a high of 1.55:1 (Table 4).

The harvested catfish and silver carp were sold in local markets. Market values for harvested fish were RMB 7/kg (\$0.93/kg) for catfish and RMB 4 (\$0.51) per kg for silver carp (Table 4). The trial yielded an average net economic return of RMB 70 per mu (\$140/ha) for the 15-mu of trial ponds. The average return on investment was 1.7% for the three trial ponds.

## **SUMMARY AND CONCLUSIONS**

All key production parameters were excellent for the Guangdong channel catfish trial, including fish growth, fish health, fish survival, and feed conversion efficiency with the ASA-IM 32/6 soy-based feed and 80:20 pond technology. Average fish production in the three trial ponds exceeded 600 kg/mu (9.2 mt/ha). Harvest of the trial in mid October, however, occurred shortly after the U.S. ban on catfish imports from China. As a result, the catfish were sold locally in live markets rather than to an export processor. The resulting low market value for channel catfish of RMB 7/kg (\$0.93/kg) resulted in a net economic loss for catfish. The only profit obtained for the trial was from the production of silver carp that resulted from using the ASA-IM 80:20 pond technology model.

Catfish producers in China are cautioned to not depend on export markets for their product. Vagaries in the market, including the 2007 U.S. ban on catfish imports from China due to contamination concerns, suggest that China catfish producers should focus on expanding domestic markets in order to remain profitable. It is recommended that the sector support expanded domestic market research and development efforts for processed aquaculture products such as catfish.

## **ACKNOWLEDGEMENTS**

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Table 1. Formula for the ASA-IM 32/6, soy-based feed used in the 2007 channel catfish trial in Guangzhou, Guangdong Province, China. The feed was produced by Ningbo Techbank Feed Mill using a least-cost formula provided by ASA-IM. The feed was produced 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%	50.00
Wheat Flour 11.7%	20.40
DDGS 24/12	16.00
Fish Meal, local 61/7	3.30
Soy Lecithin/Corn Blend	3.00
Corn Gluten Meal 60%	2.50
Ca Phosphate Mono 21%	1.79
Fish Oil (local)	1.10
Soy Oil	1.00
Vit PMX F-2	0.50
Min PMX F-1	0.25
Mold Inhibitor	0.10
Stay C 35%	0.03
Ethoxyquin, liquid 60	0.02
Choline Chloride 50%	0.01
TOTAL	100.00

Table 2. Calculated nutritional profile of the ASA-IM 32/6, soy-based feed used in the 2007 channel catfish 80:20 pond trial in Guangzhou, Guangdong Province, China. The feed was produced in extruded, floating pellet form.

Nutrient	Value, As Fed
DE Fish (extruded)	2590
NFE	38.68
Starch	17.75
Protein, crude	32.88
Protein, digestible	29.82
DE:DP Ratio	8.7:1
Fish Protein	2.01
Soy Protein	23.00
Fat	6.08
W-3 (omega 3 fatty acid)	0.52
W-6 (omega 6 fatty acid)	2.12
Fiber	4.26
Ash	6.33
Calcium	0.64
Phosphorus, available	0.60
Choline	2511
Vitamin C	105
Ethoxyquin	134.5
Arginine	2.05
Lysine	1.84
Methionine	0.51
Methionine + Cystine	1.01
Threonine	1.28
Tryptophan	0.37

Table 3. Vitamin and mineral premix formulations used in the ASA-IM 32/6 soy-based feed. Quantities of vitamins and minerals are per kilogram of premix. Premixes were produced by the Phoenix Feed Mill premix plant in Chengdu, Sichuan Province, under supervision of ASA-IM.

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 2007 ASA-IM aquaculture trial in Guangzhou that demonstrated growth performance of channel catfish from fingerling to market using the ASA 80:20 pond production model and a soy-based feed fed in extruded, floating pellet form.

Pond No.	Stocking size (g)		No. 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 <sup>1</sup>	SiC <sup>2</sup>	ChC <sup>1</sup>	SiC <sup>2</sup>		ChC	SiC	ChC	SiC	ChC	SiC			
1	91	250	700	100	157	695	1935	471.2	160.5	97	83	1.36	132	3
2	91	250	700	100	157	780	1500	532.7	136.5	98	91	1.18	442	11
3	91	250	700	100	157	625	1354	423.1	128.5	97	95	1.55	-365	-9
Mean	91	250	700	100	157	700	1596	475.7	141.8	97	90	1.36	70	1.7

<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