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# **Demonstration of Channel Catfish Production in 4-m<sup>3</sup> LVHD Cages with an ASA-IM Soy-Based Feed, Anhui Province, China**

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## **INTRODUCTION**

A cooperative feeding trial was conducted by the American Soybean Association International Marketing (ASA-IM) program and the Taihu County Fishery Extension Station, Anhui Province, China, to demonstrate channel catfish production in 4-m<sup>3</sup> cages with an ASA-IM soy-based feed and the ASA-IM Low Volume High Density (LVHD) cage technology. The feeding trial was conducted at the Taihu County Fishery Extension Center Cage Demonstration Fish Farm as a means to demonstrate the ASA-IM technology and soy-based feed to area fish farmers.

## **FEEDING TRIAL PROTOCOLS**

Three, 4-m<sup>3</sup> LVHD cages were used in the feeding trial to demonstrate the productivity and economic return of channel catfish cage culture using the ASA-IM LVHD cage technology and soy-based feed. The cages were arranged at the demonstration farm with one full cage width of open water surrounding each trial cage to ensure adequate water exchange. The cages were fitted with opaque covers following ASA-IM guidelines.

Channel catfish fingerlings were stocked in the three LVHD cages at a density of 260 fish per m<sup>3</sup> of cage volume, or 1,040 fish per cage. The average size of the catfish at stocking was 39 g.

Channel catfish were stocked in the three trial cages on 15 May 2007 and fed for 160 days with the ASA-IM 32/6 growout feed<sup>1</sup> (Tables 1-3). The ASA-IM 32/6 feed is an all or primarily plant protein feed that derives the majority of protein from soybean meal.

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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 in the three cages were fed to satiation twice daily using the ASA-IM 90% satiation techniques. Fish in the three ASA-IM feed cages received the same amount of feed at each feeding. All feed was fed in extruded, floating pellet form. The feed was manufactured by Ningbo Techbank Feed Mill based on the formulation provided by ASA-IM and with ASA-IM technical support. Feeding commenced on 16 May and continued uninterrupted for 160 days through 23 October 2007.

The target harvest size for channel catfish from all cages was 600 g per fish, representing a fish biomass at harvest of approximately 150 kg/m<sup>3</sup> of cage volume, or 600 kg per cage.

Data on fish survival, gross and net production, average fish weight, and feed conversion efficiency were obtained at harvest for all cages. All fish from each cage were counted and weighed at harvest to obtain this data. Data on production input costs was recorded throughout the trial to determine the economic return of the ASA-IM and local feeds.

## **FEEDING TRIAL RESULTS**

Channel catfish fed the ASA-IM 32/6 soy-based feed grew from 39 g to an average weight of 587 g in 160 days of feeding (Table 4). Catfish in each of the three ASA-IM LVHD cages were fed a total of 812 kg of feed, which yielded an average of 550 kg of net fish growth per cage and an average FCR of 1.48:1. Catfish survival average 96.7% for the three trial cages. Catfish production with the 32/6 feed and LVHD technology yielded a net profit of RMB 1,176 per cage and a return on investment (ROI) of 25.5%, at an average market price for channel catfish of RMB 9.8/kg (\$1.30/kg).

## **SUMMARY AND CONCLUSIONS**

Channel catfish grew well on the soy-based feed with high survival within a water temperature regime of 23° (May) to 32°C (August) in Taihu County, Anhui Province. Catfish production averaged 147.6 kg/m<sup>3</sup> in the LVHD cages, demonstrating to local farmers the advantages of the LVHD technology and rapid fish growth with the soy-based 32/6 feed.

No drugs or chemicals were used in this trial. Catfish produced qualified as “green”, contaminant-free products for the consumer market. Farmers in the region are encouraged to adopt the use of high quality soy-based feeds and LVHD cage technology as a means to produce high quality, consumer safe fish and to better ensure sustainability of the industry.

## **ACKNOWLEDGEMENTS**

ASA-IM gratefully thanks the Anhui Provincial Fishery Extension Center and the Taihu County Fishery Extension Station for their participation in this feeding trial. These organizations contributed significant time, personnel and facilities to conduct and supervise the channel catfish LVHD cage study detailed in this report.

Table 1. Formula for the ASA-IM 32/6, soy-based feed used in the 2007 channel catfish LVHD cage trial in Taihu County, Anhui 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 LVHD cage trial in Taihu County, Anhui 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 Taihu County, Anhui Province, that demonstrated fingerling to market growth performance of channel catfish in 4-m<sup>3</sup> LVHD cages with the ASA-IM 32/6 soy-based feed.

Cage No.	Stocking size (g)	Stocking rate (fish/m <sup>3</sup> )	No. days fed	Harvest wt (g/fish)	P <sub>G</sub> <sup>1</sup> (kg/cage)	P <sub>N</sub> <sup>2</sup> (kg/cage)	Survival (%)	FCR	Net income (RMB/cage) <sup>3</sup>	ROI (%)
1	39	260	160	596	598.5	558.0	96.5	1.46	1,256	27.3
2	39	260	160	561	561.0	520.4	96.2	1.56	888	19.2
3	<u>39</u>	<u>260</u>	<u>160</u>	<u>604</u>	<u>611.6</u>	<u>571.2</u>	<u>97.3</u>	<u>1.42</u>	<u>1,384</u>	<u>30.0</u>
Mean	39	260	160	587	590.4	550.0	96.7	1.48	1,176	25.5

<sup>1</sup>P<sub>G</sub> = Gross Production

<sup>2</sup>P<sub>N</sub> = Net Production

<sup>3</sup>RMB exchange rate: RMB 7.5 = \$1.00