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Largemouth Bass Produced with Soy Inclusion Marine Fish Feeds in Shanxi ASA-IM Trial

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INTRODUCTION

A feeding trial was conducted cooperatively by the American Soybean Association International Marketing (ASA-IM) program and the Shanxi Provincial Fishery Extension Center to test feed-based production of largemouth bass in ponds with high protein, soy-inclusion marine fish feeds developed by ASA-IM. The trial was conducted at the Taiyuan Municipal Fish Stock Farm in Taiyuan, Shanxi Province.

FEEDING TRIAL PROTOCOLS

The trial was conducted using the ASA-IM 80:20 pond technology model, with largemouth bass as the fed species and silver carp as the service species. Three, 2.2-mu (0.15-ha) ponds were used for the feeding trial. Largemouth bass were purchased from Guangdong Province and stocked in the trial ponds on 16 May 2006 at a density of 4,000 fish per mu (60,000/ha). Mean weight of the largemouth bass at stocking was 5 g. Target size for largemouth bass for the trial was 100 g.

Silver carp were produced locally and were stocked in the trial ponds on 26 June 2006. Silver carp were stocked in the trial ponds at a density of 1,000 fish per mu (15,000/ha). Mean weight of the silver carp at stocking was 0.25 g.

Largemouth bass were fed the ASA-IM 47/15¹ and 43/12 marine fish fingerling and growout feeds (Tables 1-5). Largemouth bass were fed the ASA-IM 47/15 fingerling feed from fish size 5 g to fish size 25 g. At 25 g in size, the largemouth bass were

¹The numerical component of the feed description refers to the percentage of protein and fat, respectively, in the ration, i.e. 47/15 indicates 47% crude protein and 15% crude fat.

weaned to the ASA-IM 43/12 feed. Weaning took place over an approximately five-day period. Both feeds were fed in extruded, floating pellet form. Feed pellet size was increased appropriately as the fish grew, with pellet size maintained at approximately one-half the full open mouth size of the fish. Largemouth bass were fed to satiation twice daily, with fish in the three trial ponds receiving the same amount of feed at each feeding. The feeds were least-cost formulated by ASA-IM, and were produced for ASA-IM by Foshan Shunde Xing Xing Feed Co., Ltd. in Guangdong Province.

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

Largemouth bass grew from 5 g to an average weight of 112 g per fish during 144 days of feeding (Table 6). Largemouth bass production averaged 359.5 kg/mu (5,393 kg/ha). The average survival rate for largemouth bass in the three trial ponds was 80.2%. The feed conversion ratio (FCR) for largemouth bass with the combination of 47/15 and 43/12 feeds was 1.14:1. Silver carp were stocked at too small a size and were eaten by the largemouth bass. None of the silver carp were recovered at harvest.

The trial yielded an average net economic return of RMB 2,275 per mu (\$4,320/ha) at a market value of RMB 26/kg (\$3.29/kg) for largemouth bass (Table 6). Return on investment (ROI) for the three demonstration ponds averaged 32.2%.

SUMMARY AND CONCLUSIONS

Largemouth bass grew 12% larger than the target size of 100 g in 144 days of feeding. The low FCR of 1.14:1 yielded by the combination of 47/15 and 43/12 marine fish feeds indicated excellent feed utilization efficiency by the bass. Largemouth bass exhibited good feeding response on the extruded feeds, but the cooperators reported a large size variation in the largemouth bass at harvest. Size variation in this trial may have been contributed to by the availability of natural forage fish in the form of the 0.25-g silver carp that were stocked 10 days later than the 5-g largemouth bass. Stocking of silver carp at least 10 g in size is recommended when stocking 5-g largemouth bass to prevent foraging by largemouth bass on the carp.

Visceral fat accumulation was noted in sample fish that were dissected at harvest. The high lipid and energy levels in the ASA-IM marine feeds may need to be adjusted for largemouth bass to prevent excessive fat deposition. Some early maturing fish were also noted at harvest.

Water quality remained good throughout the trial as a result of the high quality of the extruded feeds. No drugs or chemicals were used in the trial, allowing the harvested fish to conform to high quality “green” product standards.

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Table 1. Formula for the ASA-IM 47/15 marine fish fingerling feed fed to largemouth bass of size 5-25 g in the 2006 feeding trial conducted in Taiyuan, Shanxi Province, China. The feed was produced as a least-cost formulation by Foshan Shunde Xing Xing Feed Co., Ltd. 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
Fish Meal 71.5/6.7	40.00
Wheat Flour 13.2	23.80
Soy Protein Conc. 67.1	12.00
Soy Oil	5.80
Corn Gluten Meal 61.5	5.00
Fish Oil	5.00
Soybean Meal 45.5	4.00
Blood Meal 93/.1	2.50
Soy Lecithin	1.00
Vit PMX F-2	0.50
Min PMX F-1	0.25
Choline Chloride 50%	0.07
Stay C – 35%	0.06
Ethoxyquin, SQ mixture 6	0.02
TOTAL	100.00

Table 2. Calculated nutritional profile of the ASA-IM 47/15 marine fish fingerling feed used in the 2006 largemouth bass pond feeding trial in Taiyuan, Shanxi Province, China. The feed was produced in extruded, floating pellet form.

Nutrient	Value, As Fed
DE Fish (extruded)	3951.13
NFE	21.91
Starch	17.89
Protein, crude	47.01
Protein, digestible	44.12
Fish Protein	28.60
Soy Protein	9.87
Fat	15.02
W-3 (omega 3 fatty acid)	2.29
W-6 (omega 6 fatty acid)	3.74
Fiber	1.53
Ash	6.65
Calcium	1.77
Phosphorus, available	0.69
Choline	2556.22
Vitamin C	210.00
Ethoxyquin	134.50
Arginine	2.87
Isoleucine	1.96
Lysine	2.97
Methionine	1.09
Methionine + Cystine	1.74

Table 3. Formula for the ASA-IM 43/12 marine fish growout feed fed to largemouth bass of size >25 g in the 2006 feeding trial conducted in Taiyuan, Shanxi Province, China. The feed was produced as a least-cost formulation by Foshan Shunde Xing Xing Feed Co., Ltd. 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
Fish Meal 65/9	31.70
Soybean Meal 45.5	31.00
Wheat Flour 13.2	20.00
Corn Gluten Meal 61.5	6.00
Blood Meal 93/1	1.50
Soy Oil	2.50
Fish Oil	5.00
Soy Lecithin	1.00
Vit PMX F-2	0.50
Min PMX F-1	0.25
Calcium Phos. Mono 21%	0.47
Stay C – 35%	0.06
Ethoxyquin, SQ mixture 6	0.02
TOTAL	100.00

Table 4. Calculated nutritional profile of the ASA-IM 43/12 marine fish growout feed used in the 2006 largemouth bass pond feeding trial in Taiyuan, Shanxi Province, China. The feed was produced in extruded, floating pellet form.

Nutrient	Value, As Fed
DE Fish (extruded)	3433.43
NFE	25.80
Starch	15.97
Protein, crude	42.43
Protein, digestible	40.09
Fish Protein	20.61
Soy Protein	14.11
Fat	12.08
W-3 (omega 3 fatty acid)	2.11
W-6 (omega 6 fatty acid)	2.19
Fiber	2.28
Ash	7.33
Calcium	1.36
Phosphorus, available	0.71
Choline	2622.25
Vitamin C	210.00
Ethoxyquin	134.50
Arginine	2.51
Isoleucine	2.00
Lysine	2.76
Methionine	0.98
Methionine + Cystine	1.53

Table 5. Vitamin and mineral premix formulations used in the ASA-IM 47/15 and 43/12 marine fish feeds used in the 2006 largemouth bass feeding trial in Taiyuan, Shanxi Province. 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 Taiyuna, Shanxi Province that demonstrated growth performance of largemouth bass in ponds using the ASA 80:20 production model and ASA-IM marine fish feeds fed in extruded, floating pellet form.

Pond No.	LMB ¹ stocking size (g)	Stocking rate (fish/mu)	No. days fed	Harvest wt. (g) LMB	P _G ² (kg/mu) LMB	Survival (%) LMB	FCR	Net income (RMB/mu) ³	ROI (%)
1	5	4,000	144	106	361.6	85.5	1.13	2331	33.0
2	5	4,000	144	122	393.9	80.7	1.03	3170	44.8
3	5	4,000	144	109	322.9	74.3	1.27	1324	18.7
Mean	5	4,000	144	112	359.5	80.2	1.14	2275	32.2

¹LMB = Largemouth Bass

²P_G = Gross Production

³RMB exchange rate: RMB 7.9 = \$1.00