

# **Pond Production of $\geq 2.5$ -kg Grass Carp with a Soy-Maximized Feed**

## **Results of ASA/China 2004 Feeding Trial 35-04-83**

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### **ABSTRACT**

A feeding trial was conducted near Hefei, Anhui Province, China, to evaluate the technical and economic feasibility of growing grass carp to a  $\geq 2.5$ -kg market size with a soy-maximized aquafeed. Two-year old grass carp were stocked in three, 5.0-mu (0.3-ha) commercial fish ponds at a density of 160 grass carp and 100 silver carp per mu (2,400 grass carp and 1,500 silver carp per ha). Grass carp grew from 775 g to an average weight of 2,777 g per fish, with an average FCR of 1.74:1, in 146 days on the soy-based feed. Production averaged 440 kg/mu (6,600 kg/ha) for grass carp and 91 kg/mu (1,365 kg/ha) for silver carp. Silver carp served as a service species following the ASA 80:20 technology. Grass carp fed aggressively and grew rapidly on the soy-maximized diet, which included 50% standard soybean meal (44% crude protein) and 16% soy hulls, by volume of feed ingredients.

## **INTRODUCTION**

The American Soybean Association (ASA), in cooperation with the Changling Fish Farm, the Anhui Provincial Fisheries Extension Center, and the China National Fisheries Extension Center (NEC), conducted a five-month pond feeding trial with grass carp. The objective of the trial was to evaluate the technical and economic feasibility of producing  $\geq 2.5$ -kg grass carp using a soy-maximized feed.

## **MATERIALS AND METHODS**

Three earthen ponds of size 5.0-mu (0.33-ha) each at the Changling Fish Farm in Feidong, near Hefei, Anhui Province, were used for the feeding demonstration. Pond water depth averaged approximately 1.5 m. All ponds were equipped with water exchange and stand-by aeration.

Fish were two-year old, 775-g grass carp produced at the Changling Fish Farm. Grass carp were stocked in the three trial ponds at a density of 160 fish per mu (2,400/ha), together with 100 silver carp per mu (1,500/ha). Fish in all three trial ponds were of uniform size and age at stocking. Target market size for the grass carp was  $\geq 2,500$  g per fish.

Grass carp were fed the ASA all-plant protein, soy-based grass carp feed containing 32% crude protein and 3% crude lipid (Table 1). This feed is formulated to have 20% less energy than the standard ASA 32% protein carp growout feed, and an 8% fiber level. The feed maximizes soy use by utilizing 50% standard soybean meal (44% crude protein) and 16% soy hulls as the primary ingredients. The feed was fed in extruded, floating pellet form. Fish were fed to satiation twice daily, with fish in the three replicate ponds receiving an identical amount of feed at each feeding. The feeds were formulated by ASA and produced by Fwusow at their aquafeed mill in Fujian Province.

Trial management was based on the ASA 80:20 pond production model. Fish in all ponds were sampled once per month on approximately the same date each month. At the conclusion of the trial, all ponds were drained and the grass carp and silver carp in each pond were counted and weighed to determine average fish weight, gross and net production, feed conversion ratio (FCR) and survival. Production input costs were recorded throughout the trial and net income and ROI were calculated at the end of the trial.

## **RESULTS**

Grass carp were fed a total of 146 days between 22 May and 14 October 2004. A partial harvest was conducted after 106 days, with approximately 24% of grass carp harvested from each of the three trial ponds. Grass carp from the partial harvest had an average weight of 2,668 g (Table 2). The balance of the grass carp (76%) were harvested October

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15-18, and had an average fish weight of 2,777 g (Table 2). Gross fish production based on all harvested fish averaged 439.8 kg/mu (6,597 kg/ha) for grass carp and 91.1 kg/mu (1,366 kg/ha) for silver carp (Table 2). Average grass carp and silver carp survival rates were 99.0% and 94.8%, respectively. FCR for grass carp ranged from 1.48:1 in the first month, to 2.46:1 in the last month (Figure 1). Average FCR for the five-month production period was 1.74:1.

Average net economic return and return on investment (ROI) for the three trial ponds were negative RMB 344 per mu (-\$41.65) and negative 8.6%, respectively. It was not economical to produce  $\geq 2.5$  kg grass carp at the prevailing market price of RMB 7.5/kg (\$0.91/kg).

## **SUMMARY AND CONCLUSIONS**

Grass carp exhibited aggressive feeding behavior and rapid growth on the soy-maximized feed during their third production season. The target market size of  $\geq 2.5$  kg was reached in only 146 days with fish that weighed 775 g at stocking. The soy-maximized feed yielded an average FCR of 1.74:1, which was within an acceptable range for fish of this size and age. It was not profitable, however, to produce grass carp  $\geq 2.5$  kg in size at the prevailing market price of RMB 7.5/kg (\$0.91/kg). Breakeven price for production in this trial would have required a market price for grass carp of RMB 8.28/kg (\$1.01/kg). While production of grass carp on soy-based feeds is feasible within the production constraints that dominate the pond aquaculture industry in China, market price will be the primary determinant for production of large size grass carp for regional markets.

## **ACKNOWLEDGEMENTS**

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## **Chinese Currency and Production Unit Conversions:**

RMB 8.26 = US\$1.00  
15 mu = 1.0 hectare (ha)  
kg/mu x 15 = kg/ha

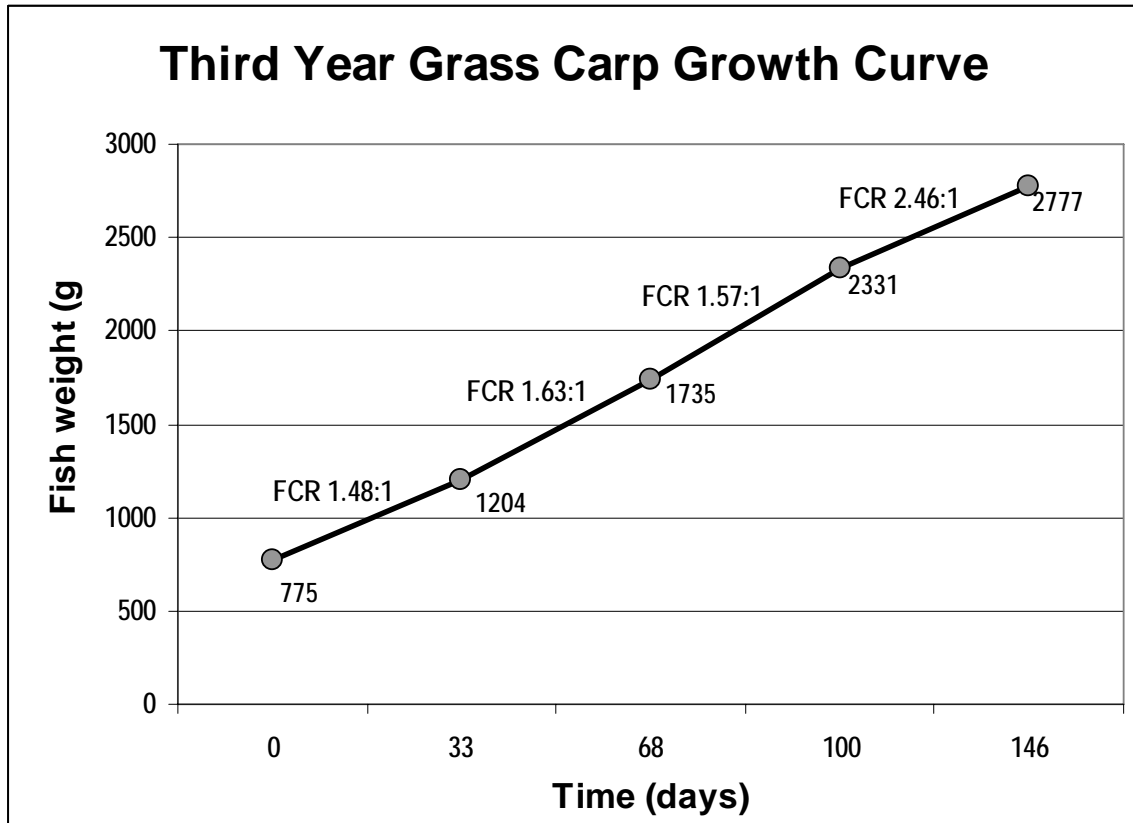


Figure 1. Growth curve for third-year grass carp production in ponds using a soy-maximized feed. Grass carp grew from 775 g to 2,777 g in 146 days. FCR ranged from 1.48:1 to 2.46:1, with an average of 1.74:1 for the 146-day production season.

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Table 1. Formula for the ASA 32/3<sup>1</sup>, all-plant protein, soy-maximized feed used in the 2004 grass carp pond feeding trial in Feidong near Hefei, Anhui Province, China. The feed is a reduced energy, high fiber feed fed in extruded, floating pellet form.

Ingredient	Percent of total
Soybean Meal 44	50.0
Wheat, SWW	21.0
Soy Hulls	16.0
Corn Gluten Meal 60%	8.9
Ca Phosphate Mono	2.43
Fish Oil, Unspec.	1.30
Vit PMX Roche 2118	0.10
Min PMX F-1	0.25
Ethoxyquin	0.02
TOTAL	100.00

<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 3% crude fat.

**ASA FY04 Anhui Grass Carp Demonstration Trial**

Table 2. Results of the 2004 ASA aquaculture feeding trial in Anhui Province that evaluated the technical and economic feasibility of culturing  $\geq 2.5$ -kg grass carp using the ASA 80:20 production model and a grass carp specific, soy-maximized feed.

Pond No.	GrC <sup>1</sup> stocking size (g)	Stocking rate (fish/mu)	No. Fish harvested	No. days fed	Harvest wt. (g)		P <sub>G</sub> <sup>3</sup> (kg/mu)		Survival (%)		FCR	Net income (RMB/mu)
					GrC	SiC <sup>2</sup>	GrC	SiC	GrC	SiC		
1	775	160	38	106	2,690	-----	103.3	-----	-----	-----	-----	-----
2	775	160	39	106	2,765	-----	106.0	-----	-----	-----	-----	-----
3	775	160	38	106	2,549	-----	97.9	-----	-----	-----	-----	-----
1	775	160	156	146	2,680	1,085	321.7	106.5	99.1	98.2	1.82	-395
2	775	160	157	146	2,875	880	347.7	76.6	98.6	87.0	1.67	-292
3	775	160	159	146	2775	915	342.8	90.8	99.3	99.2	1.74	-347
Mean	775	160	217	-----	2,777	960	439.8	91.1	99.0	94.8	1.74	-344

<sup>1</sup>GrC = Grass Carp

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

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