

Growth Performance of Common Carp Fed Soy-Maximized Feed in Low Volume, High Density Cages on Lake Maninjau, Indonesia

Results of ASA/Soy-in-Aquaculture 2003 Feeding Trial

Lukas Manomaitis and Michael C. Cremer
American Soybean Association
12125 Woodcrest Executive Drive, Suite 100
St.Louis, MO 63141 USA

ABSTRACT

A feeding demonstration was conducted at Lake Maninjau, West Sumatra, Indonesia to demonstrate the growth of common carp (*Cyprinus carpio*) fed soy maximized feeds in 1.5-m³ cages. Common carp fingerlings of 66 g were stocked into three 1.5-m³ cages at 857 fish per cage. Fish in all three cages were fed a soybean meal maximized, extruded feed that was produced domestically in Indonesia. After 82 days of culture the common carp reached an average size of 350 g with an average FCR of 1.42:1. Gross production averaged 192 kg/m³ of cage volume.

INTRODUCTION

The American Soybean Association (ASA), under the Soy-in-Aquaculture Program and in cooperation with a local farmer, Mr. Mukhlis, at Lake Maninjau, West Sumatra, Indonesia, conducted an 82-day feeding demonstration with common carp in cages. The objectives of the project were to demonstrate the feasibility of culturing common carp in low volume, high density (LVHD) cages, and to assess their performance on a soy-maximized feed.

MATERIALS AND METHODS

Three, 1.5-m³ (1.6 m x 1.6 m x 0.6 m) cages at the Mukhlis cage farm site in Lake Maninjau were used for the demonstration. The cages were constructed of 2-cm nylon mesh netting, weighted in the corners to maintain the cage shape. Each cage was equipped with an internal feed enclosure and a light blocking cover as specified in the ASA LVHD Manual “Principles and Practices of High Density Fish Culture in Low Volume Cages”. The three demonstration cages were attached to a floating platform frame at the outside edge of the cage farm and spaced to provide at least one cage length of open water on all sides of each cage to facilitate water exchange.

Common carp fingerlings of size 25 g were obtained from a local hatchery and grown on site to about 66 g for the demonstration. Common carp were stocked in the demonstration cages at a density of 857 fish per cage. Fish in all three cages were of uniform size and age at stocking. Common carp production targets were 350 g per fish and 300 kg per cage, or 200 kg/m³ of cage volume.

Common carp were fed twice daily with an extruded, floating, pelleted feed formulated to contain 32% crude protein and 6% crude lipid (32/6). The 32/6 feed was formulated by ASA to maximize soybean meal use, and contained 53% dehulled soybean meal. The 32/6 feed was produced domestically in Indonesia by JAPFA/COMFEED Feedmill in Cirebon, Java. The three cages were treated as replicates of a single feed treatment, with fish in all cages fed identically at each feeding using the ASA satiation feeding technique.

Cage management was based on the ASA LVHD cage production model. At the conclusion of the trial, all cages were completely harvested and all fish weighed. Ten percent of the harvested fish (about 200 fish) were enumerated when weighed to obtain an average fish size and to estimate fish survival. This was done to limit stress as the fish were not going directly to market at the project conclusion, but were to be transferred to another cage until the buyer came to collect them. Results were used to determine fish survival, average fish weight, gross fish production and feed conversion ratio (FCR).

RESULTS

Common carp were fed a total of 82 days between September 13 and December 4, 2003. Common carp fed the formulated feeds grew from an average of 66 g to 350 g in this period (Table 3). Gross production in the cages averaged 287 kg, or 192 kg/m³ of cage volume, with an average survival of 95% and 1.42:1 FCR (Table 3).

SUMMARY AND CONCLUSIONS

This was the first demonstration of its kind in the Lake Maninjau area and clearly demonstrated that common carp may be grown using the ASA LVHD cage technique with a soy-based, extruded feed. The farmers in this area were standardly using a high-volume, low-density (HVLD) system with sinking feeds prior to this demonstration. After observing the results, the cooperating farmer decided to further test the use of floating extruded feeds on his own. This farmer is also a distributor for feeds in the area, so this should result in other farmers adopting the use of extruded feeds. One of the most relevant comments we received was that the farmer was quite happy with the reduction in labor required to use LVHD cages with floating feeds compared to HVLD cages with sinking feeds.

Common carp performance on formulated feed in this demonstration was compromised by two issues. An error in the formulation led to Stay-C as a separate ingredient being left out of the formulation. Additionally, the vitamin and mineral premixes used were not those specified in the formulation, but standards produced by the feedmill. These omissions are believed to have reduced fish growth and increased FCR. FCR was higher than the expected level of $\leq 1.25:1$ and time of culture was 22 days longer than typically observed. However, since no comparison cages were used, an accurate determination of the impact cannot be made. The farmer also felt that the use of only two feedings per day was inadequate when three feedings are normally used on their farm. A follow-on demonstration at this site in Indonesia, which addresses the issues found in this project, is recommended to better demonstrate the production and economic advantages of the ASA LVHD technology and soy-maximized fish feed.

ACKNOWLEDGEMENTS

The ASA-SIA Program gratefully acknowledges the support of the local ASA Indonesia office, the ASA SEA regional office staff and the production and sales staff of JAPFA/COMFEED, in particular the COMFEED staff in Sumatra, Mr. Khamizhul, Mr. Satyagraha and Mr. Makruf Siregar, for their help and support of this demonstration project.

TABLE 1. Formula provided to JAPFA/COMFEED Feedmill for the ASA 32/6, soymeal-based feed used in the 2003 ASA-SIA Common Carp Demonstration Project at Lake Maninjau, West Sumatra, Indonesia that demonstrated growth performance of common carp using the ASA LVHD production model and floating formulated aquafeeds. The feed was fed in 2-mm and 3-mm pellet sizes.

**32/6¹ Freshwater Fish Growout Feed
2003 Indonesia Common Carp**

Ingredient	% Inclusion Rate
Soybean Meal 47.5%	52.80
Wheat flour 12%	23.20
Wheat pollard/bran 15%	10.25
CGM 60%	6.00
Fish Oil, local	3.53
Soy lecithin liquid	1.00
Ca Phosphate Mono	2.70
Vit PMX F-3	0.40
Min PMX F-1	0.10
Antioxidant	0.02
TOTAL	100.00

¹The 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.

ASA SIA FY03 INDONESIA DEMONSTRATION PROJECT

TABLE 2. Vitamin and mineral premix formulas provided to JAPFA/COMFEED Feedmill for the ASA 32/6 soymeal-based feed used in the 2003 ASA-SIA Common Carp Demonstration Project at Lake Maninjau, West Sumatra, Indonesia

Vitamin Premix PMX-F3¹

Nutrient	Unit	As fed
Vitamin A	IU/kg	400000
Vitamin D3	IU/kg	200000
Vitamin E	IU/kg	10000
Biotin	mg/kg	40
Folic acid	mg/kg	1000
Niacin	mg/kg	10000
Pantothenate	mg/kg	8400
Pyridoxine (B6)	mg/kg	2000
Riboflavin (B2)	mg/kg	3000
Thiamin (B1)	mg/kg	2000
Vitamin B12	mcg/kg	10000
Vitamin K	mg/kg	400
Ethoxyquin	mg/kg	500

Mineral Premix PMX-F1¹

Nutrient	Unit	As fed
Iron	ppm	40000
Manganese	ppm	10000
Copper	ppm	4000
Zinc	ppm	40000
Iodine	ppm	1840
Cobalt	ppm	20
Selenium	ppm	200

¹Premix ingredient quantities are per kg of premix.

ASA SIA FY03 INDONESIA DEMONSTRATION PROJECT

TABLE 3. Results of the 2003 SIA Common Carp Demonstration Project at Lake Maninjau, West Sumatra, Indonesia that demonstrated growth performance of common carp using the ASA LVHD cage production model and floating formulated aquafeeds.

Cage No.	Treatment	Stocking size (g)	Stocking rate (fish/cage)	No. days fed	Harvest weight (g)	Gross Production (kg/cage)	Gross Production (kg/m³)	Survival (%)	FCR
1	ASA LVHD	63	857	82	338	272	182	92	1.50
2	ASA LVHD	67	857	82	356	295	197	96	1.38
3	ASA LVHD	68	857	82	357	295	197	96	1.39
	Mean	66	857	82	350	287	192	95	1.42