

# **Fingerling Production Performance of Rohu Carp *Labeo rohita* in Ponds Using the ASA-IM Feed-Based Technology with Soy-Optimized Feed**

Lukas Manomaitis, Michael C. Cremer and P.E.Vijay Anand  
American Soybean Association International Marketing (ASA-IM)  
12125 Woodcrest Executive Drive, Suite 140  
St. Louis, MO 63141 USA

A fry to fingerling production demonstration was conducted at Thirumaniari, Tiruvaroor District, Tamil Nadu, India to demonstrate the growth of rohu carp (*Labeo rohita*) using ASA-IM pond culture methodologies and feeds. Three earthen ponds were used in the demonstration. Rohu carp fry were stocked in one pond (named Stage 1) at five million fry per hectare and cultured using the ASA-IM recommended pond maintenance techniques and a green water system for two weeks. Rohu carp were then transferred from the Stage 1 pond to two Stage 2 ponds and cultured using the feed-based ASA-IM technology with 41/11 and 36/7 soy based feeds. The rohu were stocked at an average stocking rate of about 500,000 and the fry grew from 1 g to 9.7 g in 50 days and yielded an average production of 3,439 kg/ha with 94% average survival. This was the first project of this type in India and Stage 1 results were disappointing, with a low survival rate (<25%) that may be partially attributed to an inadequate maintenance of the plankton bloom, the sole source of nutrition for the fry, and possible entrance of fry eating organisms such as frogs and water breathing insects.

## ASA-IM SIA FY06 INDIA ROHU FRY TO FINGERLING DEMONSTRATION PROJECT

### INTRODUCTION

The American Soybean Association International Marketing (ASA-IM), under the Soy-in-Aquaculture (SIA) Program and in cooperation with Arvind Farm at Thirumaniari, Tiruvaroor District, Tamil Nadu, India, conducted a 64-day fry to fingerling feeding demonstration with rohu carp in earthen ponds. The objectives of this demonstration were to show the farmer the advantages of feed based fingerling production methodology with extruded, soy-optimized aquafeeds.

### MATERIALS AND METHODS

One 0.045 ha earthen pond and three 0.0460-0.0529 ha earthen ponds were prepared for this demonstration at Arvind Farm at Thirumaniari, Tiruvaroor District, Tamil Nadu, India. All ponds were prepared using protocols based on “Preparation and Feeding Program for Carp Advanced Fry and Fingerlings” by Dr. Michael Cremer. This technique promotes the idea of a three stage carp culture cycle, with Stage 1 working with initial fry, Stage 2 developing advanced fingerlings and Stage 3 for growout of fingerlings to market size.

Stage 1: Prepare one fry production pond (prepare well in advance of stocking, fertilization rates are subject to adjustment according to bloom quality and water quality concerns):

- At least 4 weeks prior to stocking fry, dry the ponds completely and remove excess organic mud.
- Line the outer edge of the pond with physical barrier to prevent any frogs, snakehead fish (murrel), turtles or other potential carp fry predators from entering the pond. (This must be completed prior to filling the pond.)



*Example of barrier material to prevent entry of predators*

## ASA-IM SIA FY06 INDIA ROHU FRY TO FINGERLING DEMONSTRATION PROJECT

- Apply organic fertilizer at a rate of 0.5 mt/ha (chicken manure) and 1 mt/ha (cow manure) approximately 2 weeks prior to stocking, and fill pond half full (75 cm deep) with water.
  - One week before stocking, complete filling of pond (1.5 m) and apply inorganic fertilizers (urea and TSP) at the rates of 15 kg/ha for urea and 60 kg/ha for TSP.
  - Two (2) days before stocking, seine ponds with a fine mesh net to remove predatory insects, or treat fry ponds for air-breathing predatory insects with a 24:1 ratio of diesel fuel:oil at rate of 60 liters per ha; treat again at 4-day intervals for 2 weeks after stocking.
  - Stock ponds with fry from the hatchery at a rate of five million fry/ha (or for the anticipated pond size of 0.045ha 225,000 fry).
  - Maintain bloom and make sure to keep out predators and treat for air breathing insects on a regular basis.
  - Two weeks after stocking, fry should be harvested and transferred to Stage 2 ponds
- \* Note: All incoming pond water should be borehole water (or filtered through a fine-mesh (saran sock) screen to eliminate predator and competitor fish, eggs and insects.)

Stage 2: Prepare three advanced fry production ponds (well in advance of stocking):

- At least 4 weeks prior to stocking, dry the ponds completely and remove excess organic mud.
  - Line the outer edge of the pond with physical barrier to prevent any frogs, snakehead fish (murrel), turtles or other potential carp fry predators from entering the pond. (This must be completed prior to filling the pond.)
  - Apply organic fertilizer at a rate of 0.5 mt/ha (chicken manure) and 1 mt/ha (cow manure) approximately 2 weeks prior to stocking, and fill pond half full (75 cm deep) with water.
  - One week before stocking, complete filling of pond (1.5 m) and apply inorganic fertilizers (urea and TSP) at the rates of 15 kg/ha for urea and 60 kg/ha for TSP.
  - After initial fertilization, no further fertilization will be used on the Stage 2 ponds.
  - Two (2) days before stocking, seine ponds with a fine mesh net to remove predatory insects, or treat fry ponds for air-breathing predatory insects with a 24:1 ratio of diesel fuel:oil at rate of 60 liters per ha.
  - Stock ponds with fry from the Stage 1 pond (two weeks after stocking) at a rate of 600,000 fry/ha (or for the anticipated pond size of 0.05ha 30,000 fry). These advanced fry will be grown in this pond until about 10-g size.
- \* Note: All incoming pond water should be borehole water (or filtered through a fine-mesh (saran sock) screen to eliminate predator and competitor fish, eggs and insects.)

Stage 2 Ponds: Feeding (Stage 1 pond is not fed)

- Begin feeding advanced fry immediately after stocking in ponds with the ASA-IM 41/11 fry feed in #1 crumble form (particle size 0.5-mm). Feed at 10% body weight per day, divided into three equal feedings.

## **ASA-IM SIA FY06 INDIA ROHU FRY TO FINGERLING DEMONSTRATION PROJECT**

- After one week, reduce feeding rate to 6% body weight per day.
- When fish reach 3 grams in weight, reduce feeding rate to 5% body weight per day and wean fish to the ASA-IM 36/7 fingerling feed in 1.5-mm extruded, floating pellet form.
- When fish are fully weaned to the extruded feed (approximately 5 days), begin satiation feeding. Feed fish to satiation two to three times daily (as a guide, this should be about 4-5% of body weight per day, divided among the daily feedings), using the ASA-IM 90% satiation technique.
- Re-establish satiation feeding level every 5 days.
- Fingerling project should be harvested when the average size fingerlings are 10 g in weight.

Due to poor survivals in the Stage 1 pond, only two Stage 2 ponds were actually used and at a rate of about 500,000 fish/ha. Fish in all ponds were sampled once per month on about the same date each month. At the conclusion of the demonstration, all ponds were completely harvested and all fish enumerated and weighed. Results were used to determine fish survival, average fish weight, gross fish production and feed conversion ratio (FCR).

### **RESULTS**

Rohu carp in the ASA-IM Stage 1 ponds had a disappointing survival rate of <25%. As a result, the Stage 2 ponds were not stocked at the suggested 600,000 fish/ha, but instead only two of the three ponds were stocked at about 500,000 fish/ha. These Stage 2 fish were cultured for 50 days between 20 June and 9 August 2006 using 41/11 and 36/7 feeds. Rohu grew from an average of 1 g to 9.7 g in this period and yielded an average production of 3,489 kg/ha for the two ponds. The average survival rate was 94% and average FCR was 0.98:1, (Table 4).

### **SUMMARY AND CONCLUSIONS**

Although the Stage 1 pond survivals were very low in this demonstration, the farmer expressed satisfaction at the rapid growth of the fish in the Stage 2 ponds. Clients at this hatchery quickly purchased these fingerlings as soon as they were harvested. It seems clear that more needs to be done to ensure a higher survival in the initial stages of culture from the fry to early fingerling stage (1 g). The farmer was hesitant to add fertilizer to increase the bloom within two weeks of the stocking out of fear that this would harm the fry. This led to a bloom that did not appear very dense, and was probably not optimal for the early fry which require a dense bloom as an early food source. Additionally, it appeared that the farmer did not take full precautions to prevent the introductions of predators. Although a physical barrier was placed around the pond, there were still frogs observed in all ponds. Closer inspection found that filling pipes were not screened to prevent entry of predators.

Further improvements to carp production that lead to a better economic return can be achieved by adopting feed-based production strategies for all life stages of rohu carp, and in particular in the early stages. Providing high quality feeds to broodstock will increase egg production, egg and fry quality and survival, and healthier fish. Use of high quality manufactured feeds for fry

## **ASA-IM SIA FY06 INDIA ROHU FRY TO FINGERLING DEMONSTRATION PROJECT**

and fingerling stages will yield faster growing fish with better and more aggressive feed taking behavior. Growout of carp using feed based production strategies has already been shown to result in better economic returns. The ASA-IM will conduct follow-on studies to demonstrate the advantages of feed-based production at all life stages for carp, and in particular plans to conduct another fry to advanced fingerling project in 2007.

The ASA-IM encourages both the Government of India and the private sector to evaluate and promote the adoption of feed-based technologies as a means to optimize productivity with scarce water resources and to provide high quality, healthy products for Indian consumers. Adoption of feed-based technologies will also allow diversification of production species that would provide consumers accessibility to a wider range of good-health aquaculture products for an increasingly health-conscious nation.

### **ACKNOWLEDGEMENTS**

The ASA-IM Soy-in-Aquaculture Program gratefully acknowledges the local ASA-IM India office and in particular the Aquaculture Manager, Mr.G.Ramesh for their help and support of this demonstration project.

## ASA-IM SIA FY06 INDIA ROHU FRY TO FINGERLING DEMONSTRATION PROJECT

TABLE 1. Formula provided to Taiyo Feedmill for the ASA-IM 41/11, soymeal-based feed used in the 2006 ASA-IM SIA Rohu Carp Fry to Fingerling Demonstration Project at Arvind Farm, Thirumaniari, Tiruvaroor District, Tamil Nadu, India. The feed was fed in various crumble sizes.

---

### 41/11<sup>1</sup> Fingerling feed 2006 India Rohu Carp Feeding Demonstrations

---

Ingredient	% Inclusion Rate
Soybean Meal - 44%	45.00
Fish, Anchovy 65/10	25.00
Wheat, Feed Flour - 11.7%	15.70
Fish Oil	7.00
Corn Gluten ML 60%	4.75
Soy Lecithin	1.00
Calcium phos. mono - 21%	0.75
Vit. PMX-F2	0.50
Min. PMX-F1	0.25
Stay C - 35%	0.03
Ethoxyquin - 100%	0.02
<b>Total</b>	<b>100.00</b>

---

<sup>1</sup>The numerical component of the feed description refers to the percentage of protein and fat, respectively, in the ration, i.e. 41/11 indicates 41% crude protein and 11% crude fat.

## ASA-IM SIA FY06 INDIA ROHU FRY TO FINGERLING DEMONSTRATION PROJECT

TABLE 2. Formula provided to Taiyo Feedmill for the ASA-IM 36/7, soymeal-based feed used in the 2006 ASA-IM SIA Rohu Carp Fry to Fingerling Demonstration Project at Arvind Farm, Thirumaniari, Tiruvaroor District, Tamil Nadu, India. The feed was fed in 1.5 mm pellet sizes.

---

### **36/7<sup>1</sup> Advanced fingerling feed 2006 India Rohu Carp Feeding Demonstrations**

---

Ingredient	% Inclusion Rate
Soybean Meal - 44% IFN	51.50
Wheat, Feed Flour - 11.7%	10.00
Corn, whole grain	13.00
Fish, Anchovy 65/10	8.25
Corn Gluten ML 60%	7.00
Soy Oil	4.20
Blood ML con. 85/1	2.00
Calcium phos. mono - 21%	2.00
Soy Lecithin	1.00
Fish Oil, Unspec.	0.25
Vit. PMX-F2	0.50
Min. PMX-F1	0.25
Stay C - 35%	0.03
Ethoxyquin - 100%	0.02
<b>Total</b>	<b>100.00</b>

---

<sup>1</sup>The numerical component of the feed description refers to the percentage of protein and fat, respectively, in the ration, i.e. 36/7 indicates 36% crude protein and 7% crude fat.

**ASA-IM SIA FY06 INDIA ROHU FRY TO FINGERLING DEMONSTRATION PROJECT**

TABLE 3. Vitamin and mineral premix formulas provided to and produced by Avitech, New Delhi and supplied to Taiyo Feedmill for the ASA-IM soybean meal-based feeds used in the 2006 ASA-IM SIA Rohu Carp Fry to Fingerling Demonstration Project at Arvind Farm, Thirumaniari, Tiruvaroor District, Tamil Nadu, India.

Vitamin Premix PMX-F2<sup>1</sup>

<b>Nutrient</b>	<b>Unit</b>	<b>As fed</b>
Vitamin A	IU/kg	1200000
Vitamin D3	IU/kg	200000
Vitamin E	IU/kg	20000
Biotin	mg/kg	40
Folic acid	mg/kg	1800
Niacin	mg/kg	40000
Pantothenate	mg/kg	20000
Pyridoxine (B6)	mg/kg	5000
Riboflavin (B2)	mg/kg	8000
Thiamin (B1)	mg/kg	8000
Vitamin B12	mcg/kg	2000
Ethoxyquin	mg/kg	500

Mineral Premix PMX-F1<sup>1</sup>

<b>Nutrient</b>	<b>Unit</b>	<b>As fed</b>
Iron	ppm	40000
Manganese	ppm	10000
Copper	ppm	4000
Zinc	ppm	40000
Iodine	ppm	1800
Cobalt	ppm	20
Selenium	ppm	200

<sup>1</sup>Premix ingredient quantities are per kg of premix.

**ASA SIA FY06 INDIA FRY TO FINGERLING ROHU DEMONSTRATION PROJECT**

TABLE 4. Results of the 2006 ASA-IM SIA Rohu Carp Fry to Fingerling Demonstration Project at Arvind Farm Thirumaniari, Tiruvaroor District, Tamil Nadu, India that demonstrated performance of rohu carp grown from fry to fingerling size using ASA-IM production methodology with formulated feeds.

<b>Pond No.</b>	<b>Pond Size (m2)</b>	<b>Stocking size (g) of rohu carp</b>	<b>Stocking rate (fish/ha)</b>	<b>No. days cultured</b>	<b>Harvest weight (g)</b>	<b>Gross Production (kg/ha)</b>	<b>Survival (%)</b>	<b>FCR</b>
5	1000	1	472,590	50	9.7	3,449	94	0.89
8	1000	1	543,478	50	9.6	3,428	94	1.06
	<b>Mean</b>	<b>1</b>	<b>508,034</b>	<b>50</b>	<b>9.7</b>	<b>3,439</b>	<b>94</b>	<b>0.98</b>