

Growth Performance of Red Drum Fed Soy-Optimized Extruded Feed in Cages in the Tung Gau Area, Cat Ba, Vietnam

Results of ASA-IM/Soy-in-Aquaculture 2006 Feeding Demonstration Project

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ABSTRACT

A feeding demonstration was conducted in the Tung Gau Area of the Cat Ba Islands in northern Vietnam to demonstrate the growth of red drum (*Sciaenops ocellatus*) using the ASA-IM culture methodology in 27-m³ cages. Red drum fingerlings of size 114 g were stocked into three 27-m³ cages at 1,350 fish per cage and cultured according to the ASA-IM low volume, high density (LVHD) methodology. Fish in these three cages were fed a soybean meal optimized, extruded feed that was produced domestically in Vietnam. After 145 days of culture, fish grown using the ASA-IM LVHD methodology and fed the soy-maximized feed grew to an average of 1,127 g, with an average gross production of 813.3 kg/cage (30.1 kg/m³), an average FCR of 1.46 and an average survival of 54%. The ASA-IM LVHD cages in which red drum were fed formulated feeds had less bio-fouling and required substantially less management labor than traditional cages in which red drum were fed trash fish. The low survival rate was attributed to incorrect cage placement and orientation during a part of the culture period.

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INTRODUCTION

The American Soybean Association International Marketing (ASA-IM), under the Soy-in-Aquaculture (SIA) Project and in cooperation with Navy 128 Company, Vietnam, conducted a 145-day comparison feeding demonstration with red drum in marine cages. The objectives of the project were to demonstrate the feasibility of culturing red drum in low volume, high density (LVHD) cages with a soy-optimized feed.

MATERIALS AND METHODS

Three, 27-m³ (3 m x 3 m x 3 m) cages at the Navy 128 Company cage farm site in the Tung Gau area, Cat Ba, Vietnam, were used for the demonstration. The cages were constructed with a floating wooden platform from which a rectangular nylon mesh (mesh size varied according to fish size) cage net was suspended and weighed down to maintain the cage shape against water currents.

All of the cages were outfitted with an internal feed enclosure and a light blocking cover as specified in the ASA-IM LVHD Manual “Principles and Practices of High Density Fish Culture in Low Volume Cages”. The three ASA-IM LVHD demonstration cages were attached to a floating platform frame at the outside edge of the cage farm and spaced to provide at least 3 m of open water on all sides of each cage to facilitate water exchange. Cage nets were replaced on a 15-day cycle to combat bio-fouling.

Red drum were fed twice daily with an extruded, floating, pelleted feed formulated to contain 43% crude protein and 12% crude lipid (43/12). The 43/12 feed was formulated by ASA-IM to optimize soybean meal use, and contained 20% dehulled soybean meal. The 43/12 feed was produced domestically in Vietnam by Feedmill A. The three formulated feed cages were treated as replicates of a single feed treatment, with fish in all cages fed identically at each feeding using the ASA-IM satiation feeding technique. Cage management was based on the ASA-IM LVHD cage production model.

The project fish were reallocated among the three demonstration cages after a large mortality event believed to be precipitated by improper cage orientation and spacing, where the farmer placed the LVHD cages too close to other cages in anticipation of a severe storm. Surviving red drum of size 420-450 g (average 433 g) were taken from existing feed-fed cages and reallocated in the three ASA-IM LVHD cages to an estimated density of 799 fish per cage. Red drum production targets after restocking were 1,000 g per fish and 799 kg per ASA-IM cage (29.6 kg/m³ of cage volume).

Fish in all cages were sampled once per month on about the same date each month. At the conclusion of the project, all cages were completely harvested and all fish weighed. All of the harvested fish were enumerated when weighed to obtain an average fish size and to determine fish survival. Results were used to determine fish survival, average fish weight, gross fish production and feed conversion ratio (FCR).

RESULTS

Red drum were fed a total of 145 days between 9 June and 1 November 2006. Red drum fed the formulated, 43/12 feed grew from an average of 114 g to 1,127 g during this period (Table 1; Table 6). Gross production averaged 813.3 kg (30.1 kg/m³) in the formulated feed-fed cages, with an average survival rate of 54% (Table 6). Average FCR for red drum fed the formulated feed was 1.46:1. (Table 2, Table 6).

SUMMARY AND CONCLUSIONS

This project was originally stocked at a rate of 1,350 fish/cage for the ASA-IM LVHD methodology and was being compared to control cages containing 500 fish/cage. However, as the project proceeded the cooperator did not maintain the control protocols, and the comparison aspect of the demonstration project had to be cancelled.

In preparation for an anticipated storm, the cooperator moved the LVHD demonstration cages directly adjacent to other production cages instead of investing in better anchors to keep the cages in their proper position and orientation. Due to this strategy, significant mortalities were seen in the ASA-IM LVHD cages. LVHD cages require constant water exchange as they are high density systems, and by placing the LVHD cages directly next to other production cages, the ability of the water to flow through the system was hampered. As a consequence, a large mortality event occurred. Following the mortality event, the surviving fish were reallocated among the three LVHD demonstration cages. Each LVHD cage received one-third of the surviving fish.

Red drum exhibited significantly better growth and survival after restocking and relocation of the demonstration cages to their proper positions and spacing. In comparison to red drum growth in the previous year's trial, the FCR in the 2006 trial was remarkably lower and red drum exceeded the target size of 1,000 g by an average of 127 g.

Although the results of the project were positive, the declining sales price of red drum in the local market has made culture of this species unprofitable in the area and farmers are moving to new species such as sea bass, grouper, cobia and snapper. However, this project demonstrated the production advantages of the ASA-IM LVHD technology and soy-maximized, manufactured marine fish feeds which can be applied to several of the new species.

ACKNOWLEDGEMENTS

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TABLE 1: Growth table for red drum over a 145-day culture period in the 2006 ASA-IM SIA Red Drum Demonstration Project in the Tung Gau Area, Cat Ba, Vietnam. Red drum grew from 114 g to an average of 433 g in the first phase (103 days) and from 433 g to 1,127 g in the second phase (42 days) on the 43/12 formulated feed.

<u>DATE</u>	<u>ASA-IM Cages (Kg)</u>	<u>Periodic Growth (Kg)</u>	<u>Days</u>	<u>Notes</u>
6/9/2006	0.114	0	0	Stocking
7/11/2006	0.184	0.070	32	Sampling
8/13/2006	0.264	0.081	33	Sampling
9/20/2006	0.433	0.169	38	Reallocation
10/22/2006	1.033	0.600	32	Sampling
11/1/2006	1.127	0.093	10	Harvest

TABLE 2: FCR table for red drum over a 145-day culture period in the 2006 ASA-IM SIA Red Drum Demonstration Project in the Tung Gau Area, Cat Ba, Vietnam. Red drum fed with formulated feed in this period had an average overall FCR of 1.46:1.

<u>DATE</u>	<u>Periodic FCR</u>	<u>Feed used (kg)</u>	<u>Days</u>	<u>Notes</u>
6/9/2006	0	0	0	Stocking
7/11/2006	1.70	154.0	32	Sampling
8/13/2006	1.83	163.9	33	Sampling
9/20/2006	2.22	299.7	38	Reallocation
10/22/2006	0.66	299.0	32	Sampling
11/1/2006	2.24	151.5	10	Harvest
Overall	1.46	1068.1	145	

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TABLE 3. Feed formula provided to Feedmill A for the initial ASA 43/12, soymeal-based feed used in the 2006 ASA-IM SIA Red Drum Demonstration Project in the Tung Gau Area, Cat Ba, Vietnam. The feed was fed in 4-6 mm pellet sizes. The feed was least-cost formulated using ingredients available at the time of production.

43/12¹ Marine Fish Growout Feed

Ingredient	% Inclusion Rate
Fish, Tuna 62/9	40.00
Wheat, Feed Flour - 15.4/2	20.00
Soybean Meal - 47%	20.00
Squid Oil	7.32
Cassava Meal	5.00
Blood ML con. 85/1	4.50
Feather ML, 85/3	2.00
Vitamin Premix F2	0.50
Mineral Premix F1	0.25
Antioxidant (Van Sanh)	0.20
Mold Inhib.	0.10
Choline Chloride - 60%	0.10
Lutavit C 35%	0.03
TOTAL	100.00

¹The numerical component of the feed description refers to the percentage of protein and fat, respectively, in the ration, i.e. 43/12 indicates 43% crude protein and 12% crude fat.

TABLE 4. Feed formula provided to Feedmill A for the second production run of the ASA 43/12, soymeal-based feed used in the 2006 ASA-IM SIA Red Drum Demonstration Project in the Tung Gau Area, Cat Ba, Vietnam. The feed was fed in 6-8 mm pellet sizes. The feed was least-cost formulated using ingredients available at the time of production.

43/12¹ Marine Fish Growout Feed

Ingredient	% Inclusion Rate
Fish, Tuna 62/9	40.00
Wheat, Flour - 16%	20.00
Soybean Meal - 47%	20.00
Squid Oil	7.32
Cassava Meal	5.00
Blood ML con. 85/1	4.50
Feather ML, 85/3	2.00
Vitamin Premix F2	0.50
Mineral Premix F1	0.25
Antioxidant (Van Sanh)	0.20
Choline Chloride - 60%	0.10
Mold Inhib.	0.10
Lutavit C 35%	0.03
TOTAL	100.00

¹The numerical component of the feed description refers to the percentage of protein and fat, respectively, in the ration, i.e. 43/12 indicates 43% crude protein and 12% crude fat.

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TABLE 5. Vitamin and mineral premix formulas provided to Bayer of Vietnam to supply to Feedmill A for the ASA-IM 43/12 soymeal-based feed used in the 2006 ASA-IM SIA Red Drum Demonstration Project in the Tung Gau Area, Cat Ba, Vietnam.

Vitamin Premix PMX-F2

BASF Product	Composition	BASF g product per kg premix	Vitamin Activity per kg BASF product	Vitamin Activity per kg premix
Lutavit A 500	50% vitamin A acetate	2.400	500,000,000 IU vitamin A	1,200,000 IU
Lutavit D3 500	50% activated 7-dehydrocholesterol	0.400	500,000,000 IU vitamin D3	200,000 IU
Lutavit E 50	50% dl-alpha-tocopheryl acetate	40.000	500,000 IU vitamin E	20,000 IU
Lutavit Biotin (H) 2% SD	2% d Biotin	2.000	20,000 mg biotin	40 mg
Lutavit Folic Acid 97	97% folic acid	1.856	970,000 mg folic acid	1800 mg
Lutavit Niacin 99.5	99.5% nicotinic acid	40.191	995,000 mg niacin	40,000 mg
Lutavit CalPan	100% calcium d-pantothenate	21.734	920,000 mg pantothenate	20,000 mg
Lutavit B6	99% pyridoxine hydrochloride	6.136	814,770 mg pyridoxine	5,000 mg
Lutavit Riboflavin SG 80	80% riboflavin	10.000	800,000 mg riboflavin	8,000 mg
Lutavit B1	98% thiamin mononitrate	8.897	899,052 mg thiamin	8,000 mg
Lutavit B12 - 1%	1% cyanocobalamine	0.200	10,000 mg vitamin B12	2 mg
Ethoxyquin, SQ mixture 6	66% ethoxyquin	0.758	660,000 mg ethoxyquin	500 mg
Wheat Flour - 13.2%		865.428		
Total		1000.000		

Mineral Premix PMX-F1¹

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

¹Premix ingredient quantities are per kg of premix.

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TABLE 6. Results of the 2006 ASA-IM SIA Red Drum Demonstration Project at the Tung Gau Area, Cat Ba, Vietnam that demonstrated growth performance of red drum using the ASA-IM LVHD production model with formulated aquafeeds.

Cage No.	Treatment	Stocking size (g)	Stocking rate		No. days cultured	Harvest weight (g)	Gross Production		Survival (%)	FCR
			(fish/cage)	(fish/m3)			(kg/cage)	(kg/m ³)		
68	Formulated	112	1,350	50	145	1,130	818.2	30.3	54	1.46:1
77	Formulated	116	1,350	50	145	1,120	797.1	29.5	53	1.49:1
88	Formulated	114	1,350	50	145	1,130	824.7	30.5	54	1.44:1
	Mean	114	1,350	50	145	1,127	813.3	30.1	54	1.46:1