

Application of the United States Soybean Export Council Program's Soy-optimized Floating Feeds and Low Volume, High Density Cage Aquaculture Technologies

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Abstract

The United States Soybean Export Council's (USSEC) Soy-In-Aquaculture (SIA) project in the Philippines introduced the Low Volume High Density (LVHD) cage culture production methodology in 2003. The aim of this technology is to maximize farmers profit, improve productivity, reduce feed conversion ratios (FCR) and limit environmental degradation. The Philippine fish farmers were very conservative and hesitant about adopting the USSEC SIA Low Volume High Density (LVHD) cage culture technology, particularly the new feeding techniques using extruded floating feeds. This conservative attitude was highlighted with different projects using Nile tilapia (*Oreochromis niloticus*), milkfish (*Chanos chanos*) and snubnose pompano (*Trachinotus blochii*) in USSEC SIA LVHD cage feeding demonstrations conducted in different commercial farms in the Philippines.

Keywords: low volume high density, extruded floating feeds, target biomass, cage positioning, feeding management

Introduction

The United States Soybean Export Council (USSEC) program under the Soy-In-Aquaculture (SIA) Project conducted different feeding demonstrations using Nile tilapia (*Oreochromis niloticus*), milkfish (*Chanos chanos*) and snubnose pompano (*Trachinotus blochii*) at different commercial cage farms in the Philippines. The objective of the USSEC Low Volume High Density cage production technology

demonstration was to show the correct application of the following: (a) USSEC-developed satiation feeding technique, (b) least-cost formulated soy-optimized aquafeeds, (c) feed enclosures in the cages to prevent floating feeds from exiting the cages, and (d) cage positioning for better water exchange in the cages, which is critical for good results in a high density system.

Materials and Methods

For the Nile tilapia feeding demonstrations, five units of 3 x 3 x 2.5 m or 22.5 m³ bamboo floating cages were used in a commercial farm in Taal Lake, Batangas, Philippines. Tilapia fingerlings of about 7.5 g were stocked in the 22.5 m³ cages at a density of 8,700 fish per cage. Fish in all five cages were of uniform size and age at stocking. Tilapia production targets were 300 g per fish and 2,250 kg per cage, or 100 kg m⁻³ of cage volume. Tilapia were fed thrice daily with USSEC 36/7 soy-optimized extruded floating feed for tilapia weighing 7.5 g to 50 g, and fed twice daily with USSEC 32/6 extruded floating feed for tilapia 50 g to harvest. These feeds were formulated by USSEC and produced domestically in the Philippines. The five cages were treated as replicates of a single feed treatment, with fish in all cages fed to satiation twice to thrice daily every seven days, using the USSEC satiation feeding technique.

For the milkfish feeding demonstrations, four units of 5 x 5 x 4 m or 100 m³ bamboo floating cages were used in Panabo City, Davao del Norte, Philippines. Milkfish fingerlings of about 32.0 g were stocked in the 100 m³ cages at a density of 7,800 fish per cage. Fish in all four cages were of uniform size and age at stocking. Milkfish production targets were 500g per fish and 3,750 kg per cage, or 37.5 kg m⁻³ of cage volume. Milkfish were fed five times daily with USSEC 34.7/9.8 soy-optimized extruded floating feed for milkfish 25 g to harvest. These feeds were formulated by USSEC and produced domestically in the Philippines. The four cages were treated as replicates of a single feed treatment, with fish in all cages fed to satiation five times daily every seven

days, using the USSEC satiation feeding technique.

For the pompano feeding demonstration, three units of 3x3x3 m or 27 m³ floating steel cages were used in Cebu, Philippines. Pompano fingerlings of about 19.0 g were stocked in the 27 m³ cages at a density of 2,150 fish per cage. Fish in all four cages were of uniform size and age at stocking. Pompano production targets were 500 g per fish and 1,075 kg per cage, or 39.8 kg m⁻³ of cage volume. Pompano were fed twice daily with USSEC 43/12 soy-optimized extruded floating feed for fish from 19 g to harvest. These feeds were formulated by USSEC and produced domestically in the Philippines. The three cages were treated as replicates of a single feed treatment, with fish in all cages fed to satiation twice daily every ten days, using the USSEC satiation feeding technique.

In all the demonstration cages, the nets were made from a rectangular nylon mesh cage net which were suspended and weighted down to maintain the cage shape against water currents. As the fish grew, the mesh sizes of cage nets were increased to maximize water exchange. Each cage was equipped 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”.

Cage management was based on the USSEC cage production model. 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 fish survival. Results were used to

determine fish survival, average fish weight, gross fish production and feed conversion ratio (FCR).

Results

Tilapia was fed for 132 days between 29 July and 08 December 2011. Tilapia grew from an average of 7.5 g to 300 g in this period and yielded an average production of 1,572 kg cage⁻¹ or 70 kg m⁻³. Mean survival rate was 60% and average FCR was 1.47:1.

Milkfish were fed for 133 days between 31 May 2012 and 11 October 2012. Milkfish fed with 34.7/9.8 grew from an average of 32 g to 379 g, with a mean FCR of 1.92:1. Average production was 2,776 kg cage⁻¹ or 27.8 kg m⁻³ with a mean survival rate of 99%.

On the other hand, pompano were cultured for a total of 142 days between 29 July and 17 December 2008. Pompano fed USSEC 43/12 diet grew from an average of 19 g to 338 g, with a mean FCR of 2.38:1. Average production was 763 kg /cage or 28.2 kg m⁻³ with a mean survival rate of 99.1%.

Discussion

This is the first time for most of the cooperators to try the USSEC feed-based LVHD cage culture technologies. The feed manager and technicians required some time to learn the satiation feeding technique during the first months of culture. This unfamiliarity with the USSEC

feeding management technique could have been one factor why the target weight of some fish was not attained.

Despite the problems encountered in implementing these new technologies, at the end of each project, the fish farmers were able to appreciate the positive aspects of the USSEC LVHD cage culture technology. The farms that have adopted the use of maximum cage volumes, target biomass densities, proper cage positioning, use of high quality extruded floating feeds and USSEC satiation feed management have recognized its benefits compared to their traditional commercial culture methods and have improved their production.

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Suggested Readings

Schmittou HR. 1997. Principles and Practices of High Density Fish Culture in Low Volume Cages. American Soybean Association.