PARTNERS IN BUILDING MARKETS:
AMERICAN SOYBEAN FARMERS SUPPORTING AMERICAN AQUACULTURE

INTRODUCTION:

Soybean farmers began to actively support our domestic aquaculture industry in 2001 with the introduction of its Soy-in-Aquaculture program. It began with the staffs of the United Soybean Board (USB), the American Soybean Association (ASA) and various state soybean grower-affiliated organizations meeting with aquaculture researchers and marketers to develop an action plan. It was recognized that the success of this major initiative was not only in the interest of the American soybean industry, which sought to create greater demand for its production, but also the world aquaculture industry, which needs nutritional, economical, renewable and environment-friendly alternatives to fishmeal. The initial focus of the program was aimed at identifying the anti-nutritional factors in soybean meal and how they affect Salmonide production.

The purpose of this report is to provide you examples of the contributions our soybean farmers are making to assist in building a strong domestic aquaculture industry. It describes ten of the numerous projects, ranging from education to policy, presently funded by our farmers. They are part of the estimated $1.4 million provided for domestic aquaculture in FY10 alone by both the national and state soybean associations through the national soybean check-off and, for lobbying, from soybean farmer membership funds.

EDUCATION:

OUTREACH PROGRAM WITH NAA:

Soybean farmers are supporting the National Aquaculture Association (NAA) in educating media, stakeholders and consumers on the economic, health and environmental benefits of U.S.-produced aquaculture products. Support for NAA began in FY 2008 with assistance in developing a media kit, educational materials and a simple trade show display.

In 2009, farmer-funded project participation at trade shows provided the opportunity to speak directly with different constituencies including foodservice operators, chefs, retailers, aquaculture industry stakeholders, seafood wholesalers, extension professionals, and educators. All groups identified the critical need for educational materials and programs that would allow them to answer consumer questions clearly and concisely. Many were acutely aware of the misinformation and disinformation surrounding aquaculture production, but felt ill equipped to effectively address these negative perceptions. Retailers, wholesalers, and culinary professionals clearly understood the importance of farm raised seafood in supplementing the wild harvest. They believed these products fit into their overall business strategies, but were concerned about their acceptance by the public.

The major goal of the FY 2010 project is to develop a positive public perception of aquaculture through: 1) helping to ensure that U.S. aquaculture is conducted in an environmentally sound manner, 2) developing an education/ public relations strategy that will allow producers and other stakeholders to respond directly to target audiences, 3) empowering producers through communications training to accurately represent the industry to media, buyers, the general public, and environmental interests, and 4) developing direct contact with consumers, buyers and other current and potential user groups via a consumer friendly website, exhibiting at trade shows such as the Boston Seafood Show and the American Dietetic Association, and distribution of media kits. Each of these goals fits the long-term goal of growing the aquaculture industry to meet the demands of consumers.

NAA is also conducting 10 workshops in partnership with local aquaculture organizations. The workshops titled "The Four P's of a Safe and Sustainable Aquaculture Industry: Practices, Presentation, Promotion and the Press, "are implemented across the U.S. and sponsored by the NAA, USB and a third-party local entity, such as a state or species aquaculture association. Emphasis is placed on attracting educators including high school agriculture teachers, extension professionals, Sea Grant agents, and others who can expand the outreach of the program to their students and constituents. The objective of the workshops is to empower producers through training and education and assist them in better understanding U.S. aquaculture practices and how these practices form the basis for a sustainable and growing aquaculture industry. These producers will serve as a group of industry advocates who have the necessary information, knowledge, and skills to help shape the public's opinion of aquaculture.

(For further information on this project, please contact Ms. Melanie Fitzpatrick, USB U.S. Utilization Director, at Melanie.Fitzpatrick@smithbucklin.com

RESEARCH:

POND TO PLATE PROJECT (P^3): A PARTNERSHIP TO ADVANCE THE U.S. CATFISH INDUSTRY**:**

The U.S. catfish industry has been declining for several years and has reached a crossroads for its survival. Foreign competition, declining demand, falling prices, and high input costs plague the industry and, as a result, the primarily rural economy of West Alabama is threatened by a weakened, or possibly the loss of, our catfish industry. In fact, catfish-related jobs and income in West Alabama have dropped more than 12% since 2005, illustrating the severity of this decline. Short- and medium-term opportunities must be developed to transform our catfish industry into a modern livestock industry.

The Pond to Plate Project" (P^3) is a public/private partnership involving the production, processing, and distribution supply chain; university researchers and extension experts;

and suppliers to the industry such as feed mills, equipment manufacturers, utility companies, etc. Solutions to industry problems lie in improved production efficiency, improved product quality, and increased product promotion to boost consumer demand.

A primary P3 goal is to develop Best Management Practices (BMPs) for catfish production and Standard Operating Procedures (SOPs) for harvesting, hauling, processing, distribution activities, etc., to improve industry efficiency and product quality.

The objectives of the project are to:

- Develop an economic performance baseline used for comparing future system improvements that utilize newly developed BMPs and SOPs.
- Partner with producers to make incremental changes in production units that lead to better production strategies and BMPs resulting in increased profit. Changes may include husbandry techniques, inventory control, water quality, aquatic animal health, predator management, etc.
- Conduct parallel production trials in production ponds at Auburn University.
- Develop, test, and evaluate SOPs for harvesting, grading, loading, hauling, processing, distributing, and retailing, that when implemented, will lead to improved product quality from the pond to the consumer.
- Collect cost and return data from all activities in the P3 to measure the economic impact of the new BMPs and SOPs for comparison with economic performance baseline data.
- Develop catfish marketing models for institutional and retail outlets.
- Communicate P3 activities and results to producers, processors, support industries, and associations and seek input throughout the process.

The expected outcome of the project is:

- Reduced catfish production costs.
- Improved catfish product quality and consistency, i.e. flavor, appearance, and texture.
- Increased consumption of catfish products.
- Secured higher prices for higher quality products at the producer and processor levels.
- Developed sets of industry BMPs and SOPs.
- Improved communication and cooperation throughout the supply chain.

(For further information on this project, please contact Dr. Terrill Hanson, Aquaculture Economist & Associate Professor, and Auburn University, at trh0008@auburn.edu)

A CONTROLLED ENVIRONMENT, INTEGRATED APPROACH TO FISH AND PLANT PRODUCTION IN ALABAMA:

The U.S. farm-raised fish industry continues to struggle due to competition from less expensive, imported seafood substitutes and to increased feed and energy costs. Round weight processing of U.S. catfish has decreased by 35-40% over the last five years and estimated catfish cost of production is currently below the offered buying price by processors confronted with growing external competition. Tilapia imports have now surpassed domestically grown catfish in product volume and value. New, more competitive, and innovative production approaches are needed for producers and their communities.

This project initiates a paradigm shift in commercial aquaculture of food animals to address competition within a world market. Aquaculture production systems in controlled temperature structures not only produce food fish, they also offer a valuable water resource enriched with concentrated fish waste and bio-flocs that can be efficiently and economically used to fertilize and grow high valued vegetables, herbs, fruits, ornamentals and tree products in addition to fish products. Successful diversification of food products from integrated aquaculture operations could reduce financial risks as plant and animal products often have counter-cyclical price cycles. New designs in aquaculture production technologies (partitioned aquaculture systems, recirculating systems, and in-pond raceways) over time will be integrated with plant production systems on collaborating producer farms to lower risk, provide additional income streams and generally improve the financial sustainability of rural producers and small stake-holders. Project results can lead to a transformation of the struggling U.S. catfish industry and there-by re-vitalize rural and impoverished communities where farm-raised catfish production occurs. This project proposes to continue efforts to employ intensive, thermally controlled, energy and water efficient fish production strategies. Specifically, these approaches allow for greater profitability through elevated levels of production and reduced unit costs for fish as well as efficient entrapment and removal of particle (manure) and dissolved nutrients. These unused nutrient by-products (fertilizers) are subsequently utilized in production of marketable plants, forage grasses and bio-fuels which efficiently utilize such nutrients and water in their production.

The project focuses on two levels of production intensity (and investment levels) to better cover the range of producer interest. The first part of the project involves retro-fitting an existing greenhouse system project at the Auburn University E.W. Shell aquaculture facility to raise its level of productivity with a relatively low facility improvement cost. The adjacent horticultural component (greenhouse) addresses issues of sustainability and allows testing of the economics of small scale integrated system of plant and fish production available in all southern states. The work makes the most of non-renewable resources, while creating value-added products from currently valueless by-products through use of natural biological cycles, particularly with regard to composting.

The second part of the project involves placement of a commercial-scale, intensive, controlled temperature production system on a farm location highly visible on a day to day basis to fish farm operators/owners in eastern Mississippi and west Alabama. Its purpose is to act as focal point for on-going research and development demonstration for integrated fish and plant culture. The fish production systems are linear, water movement is developed by airlifts with "no moving parts". A centralized blower provides both life support as well as water movement through the production and bio-filter apparatus. We will develop a reliable and accurate data base to compare the relative economics and efficiencies of two intensive fish production systems (Opposing Flows and a homemade system employing a Poly-geyser filtration system) as well as develop a thorough economic analysis of the use and value of a relatively concentrated waste-water stream for production of a variety of plants. Auburn has used this research platform to successfully leverage other funds to further develop controlled environment production systems for aquatic species.

(For further information on this project, please contact Dr. Jesse Chappel, Extension Fisheries Specialist & Assistant Professor, Auburn University, at chappj1@auburn.edu)

DEVELOPMENT AND APPLICATION OF SOY BASED DIETS FOR MARINE SHRIMP:

Plant-based feeds present an environmentally-sustainable alternative to fish meal-based diets. Removal of marine products from shrimp feed formulations does represent a challenge. However, we have been very successful at removing fish meal and other marine ingredients from commercial shrimp feed by properly balancing nutrients that become limiting e.g. essential amino acids, essential fatty acids, cholesterol and minerals. Due to limited information, some nutrient requirement data had to be established which then lead to enhancement of soy products in the diet. Albeit, we have made considerable advances in these feed formulations, there are still a number of nutritional concepts and management strategies that need to be evaluated to promote plant based diets and responsible culture conditions. This year's research concentrated on two areas which included replacement strategies for marine fish oil using a single or combination of plant oils as well as the demonstration of the use of high soy diets across a range of stocking densities.

To evaluate strategies to replace marine fish oil, a growth trial was conducted in outdoor tanks at the Texas AgriLife Research Mariculture Laboratory in Corpus Christi, Texas. Diets were designed as plant based diets using soybean meal (54.4% and corn gluten meal 6.0%) as the primary protein sources and menhaden fish oil as the primary oil source. The objective of the study was to evaluate the response of shrimp to diets with decreasing levels of fish oil as replaced by traditional soybean oil either with or without adjustment in the ω3/ω6 ration. A 58-day trial was conducted with *Litopenaeus vannamei* juveniles (1.55±0.03g), previously conditioned to a commercial shrimp diet (35% CP, Rangen, Buhl, Idaho). Shrimp were stocked in an outdoor green water recirculating system consisting of sixty-five 800 L HDPE tanks (0.65 m^3 water volume) at a density of 26 shrimp/tank (40/m^3 or 31/m^2). Tank water was recirculated at a rate of 1.9 L min^{-1} and aeration was provided by two airstones (7-10 L min^{-1}). Naturally-

induced primary production was present and no external biofiltration was provided. A total of twelve diets with five replicates per treatment were evaluated. Three sets of experimental diets were prepared to contain 36% protein and 7% lipid. The first set of diets included six ratios of fish oil to traditional soy oil inclusion (100:0, 50:50, 40:60, 30:70, 20:80, 10:90); the second set included equivalent treatments (40:60, 30:70, 20:80, 10:90) in which the ω3/ω6 ratio was adjusted using flaxseed oil to that of the 50:50 diet (ω3/ω6 ratio of 0.521), two additional diets were tested to provide a wider range of ω3/ω6 ratio's they included a 10:90 only flaxseed oil (no soy oil, ω3/ω6 ratio of 2.993), and a 10:90 Low linolenic soy oil (ω3/ω6 ratio of 0.091) diet. All diets were compared to the commercial (Rangen) control diet. One-way ANOVA showed no significant differences (at $P<0.05$) between treatments for mean final weight (16.46±0.56 g), yield (0.65 kg/m^3), FCR (1.17±0.05), weekly growth (1.83±0.07 g), and survival (0.99±0.03). Fatty acid composition of the shrimp has yet to be determined but is most likely going to reflect that of the diet. Based on these results, it is clear that most of the fish oil can be removed from shrimp feed formulations as long as minimal requirements for EFA are met. Shrimp seem to be very tolerant to a wide range of ω3/ω6 ratios. Because most markets desire seafood with a high ω3/ω6 ratio the mixing of oil sources should be such as to preserve the health benefits of seafood.

The second component of this research project included the demonstration of the use of high soy diets under a variety of culture conditions. Additionally, we will present partial budget analyses to account for any variations in returns from the various densities and size classes of shrimp that are harvested from the pond production trials. For this work a series of experiments were designed to evaluate the effects of stocking density on the growth performance of *L. vannamei* reared in production ponds and an outdoor tank system at Claude Peteet Mariculture Center AMRD. Gulf Shores, Alabama. Post larvae were obtained from Shrimp Improvement Systems in the Florida Keys, Florida and nursed for two weeks then juvenile shrimps were collected and stocked in sixteen 0.1 ha ponds (4 replicates per treatment) with 4 different stocking densities of 17, 26, 35, and 45 shrimp/m^2.

The weekly cast netting for sub sample was done to examine week growth and to inspect the shrimp health and growth. The experiment is currently ongoing and the pond growout stage is scheduled to last 16 weeks. After 15 weeks of pond culture, cast net samples ranged from 21-23.8 g, and all treatments are showing no significant differences in the weekly weight samples. At the end of the experiment, weight gain, FCR and survival will be evaluated. Additionally, juvenile *L. vannamei* (2.8g initial weight) obtained from production ponds were stocked in the outdoor semi-closed recirculating system containing 24, 800-l tanks and 1, 800-l reservoir (4 replicates per treatment) with 6 different stocking densities of 15, 25, 35, 45, 55, and 65 shrimp/m^2. Water was pumped in at 6 hr/day from a production pond to mimic production pond conditions and water exchanges occurred daily throughout the 10 week trial. Daily feed inputs for both trials were calculated, based on an expected weight gain of 1.3 g per week and an expected feed conversion ratio of 1.2:1. Weight gain was significantly higher in the low density group at 15 and 25 shrimp/mlain ^{2} (16.13±0.82 g, and 15.71±0.58 g) compared with those higher density at 35, 45, 55, and 65 shrimp/m^2 (14.56±0.59 g, 14.07±0.88 g, 13.64±0.49 g, and 13.43±0.53 g, respectively). Based on regression analyses, there is a linear decrease in final weights with increasing density (R^2 =

0.6293). Feed conversion ratio (offered feed/gain) was significantly lowest at 15 shrimp/m² (1.15±0.06) compared with those reared at density of 25, 35, 45, 55, and 65 shrimp/m² (1.26±0.02, 1.39±0.07, 1.41±0.05, 1.53±0.06, and 1.54±0.07, respectively). The FCR followed a log linear response with increasing FCR as the density increased (R2 = 0.86). However, there was no significant effect of stocking density on survival rate. The outdoor tank data clearly indicates a density dependent response of the shrimp under tank culture conditions. The response in the ponds does not appear so clear. Once, the ponds are harvested and the data collected we will evaluate production results from both the biological response of the shrimp as well as economic returns.

The research results of previous projects have been presented in a number of trade meetings as well as research and popular publications. In addition to the previously described research, Dr. Davis has participated in a number of training programs sponsored by other soy projects. Training programs and or informal seminars have been conducted in Asia (China, Thailand, Indonesia, Vietnam and Philippines) as well as a number of Latin American Countries (Columbia, Ecuador, Mexico, and Venezuela). The one on one meeting and/or training programs has been a great asset to the industry and have allowed us to shift feed formulations in a number of countries toward higher levels of inclusion of soy based products. In terms of future recommendation, we have made great strides in developing soy based diets for shrimp. However, there are still areas of nutrition that could be optimized and new cultivars for which their potential as feed ingredients has yet to be evaluated. Of course supporting the demonstration of soy based feed, providing technical support to the industry as well as the promotion of sustainable culture technologies and soy based feeds should remain a corner stone of the project.

(For further information, please contact Dr. Allen Davis, Associate Professor, Aquatic Animal Nutrition, Auburn University at davisda@auburn.edu and/or Dr. Tzachi M. Samocha, Regents Fellow & Professor at the AgriLife Research Mariculture Laboratory, at t-samocha@tamu. edu)

PRODUCTION PERFORMANCE AND TISSUE FATTY ACID COMPOSITION OF RAINBOW TROUT FED DIETS CONTAINING TRADITIONAL AND NOVEL LIPIDS

So long as essential fatty acid (FA) requirements are met, most fishes tolerate a wide range of alternative lipids in grow-out feeds. However, grow-out feed FA composition influences beneficial long-chain polyunsaturated FA (LC-PUFA) retention within the fillet. Specifically, we have observed grow-out feeds containing higher levels of saturated FA (SFA) to yield fillets with greater LC-PUFA content. To address whether different lipid sources similarly influence rainbow trout (RBT) production performance and tissue composition, we fed juvenile (~20 g) RBT complete feeds containing fish oil (FISH), or a 50:50 blend of fish and coconut (COCONUT), palm (PALM), standard soybean (STD-SBO), hydrogenated soybean (HYD-SBO), low linolenic acid soybean (LO-ALA-SBO), or low linolenic acid canola (LO-ALA-CAN) oils. Two SFA-enriched lipid streams derived from cottonseed (SFA-COT) and soybean (SFA-SBO) processing were also evaluated as 50% fish oil substitutes.

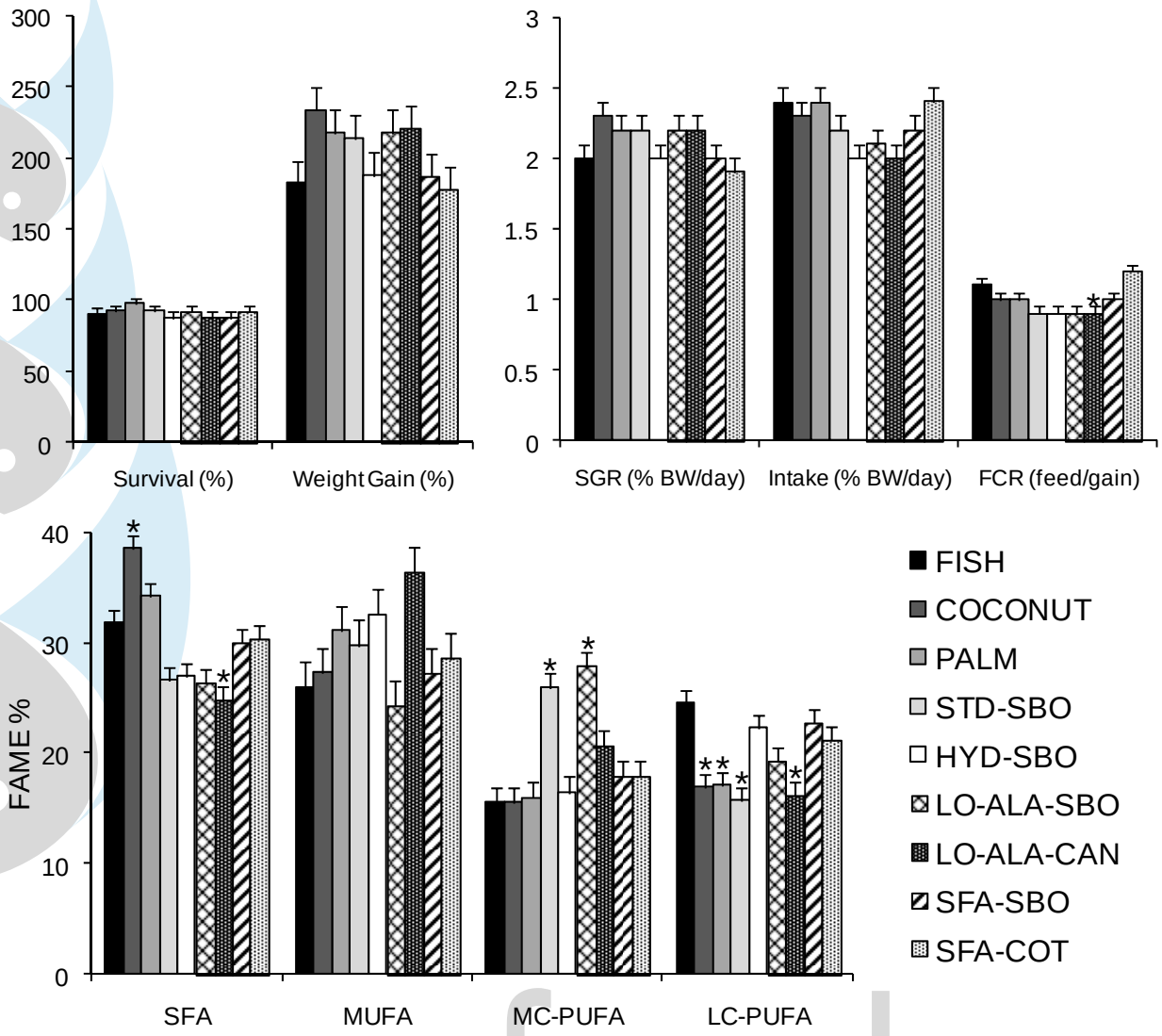

Figure 1. Production performance and fillet total lipid fatty acid profile. Bars with asterisks are significantly different from the FISH control group; error bars represent standard error.

After 7 weeks of culture, production performance of all groups was within acceptance ranges for juvenile RBT (Figure 1). Although FCR varied significantly among treatment groups, these effects were minor and none of the experimental groups were significantly outperformed by the FISH control group. Fillet FA composition generally reflected nutritional history; however, feeding certain of the SFA-rich lipids resulted in greater retention of LC-PUFA (Figure 1).

Fillet levels of LC-PUFA among fish fed the HYD-SBO, LO-ALA-SBO, SFA-SBO, and SFA-COT feeds were equivalent to those fed the FISH feed, despite a ~50% reduction in dietary LC-PUFA intake. Fillets from these groups were also comparable with respect to SFA and monounsaturated FA (MUFA) content, though the LO-ALA-SBO group did exhibit significantly elevated levels of medium-chain polyunsaturated FA (MC-PUFA).

Our results indicate a variety of alternative lipids are effectively utilized by RBT when used to replace 50% of dietary fish oil. However, alternative lipids rich in certain SFA may provide strategic advantage in terms of maintaining a beneficial FA profile within the resultant fillets.

(For further information on this project, please contact Dr. Jesse Trushenski, Assistant Professor, Fisheries & Aquaculture Center, Southern Illinois University, at saluski@siu.edu)

INVESTIGATIONS TO REPLACE FISH MEAL IN THE DIETS OF TWO MARINE FINFISH WITH SOY-BASED PRODUCTS IN SOUTHERN CALIFORNIA

Researchers at Hubbs-SeaWorld Research Institute (HSWRI) have been engaged in the production of marine finfish for nearly 30 years. Aquaculture is one of HSWRI's four core areas of research derived from its mission statement, "To return to the sea some measure of the benefits derived from it." HSWRI operates two research hatcheries in Southern California and two net pen facilities. The goals of HSWRI's aquaculture program are to 1) develop methods that are innovative, efficient and environmentally responsible, 2) raise the highest quality product possible, and 3) bridge the gap between research and commercial-scale production.

Two of the most promising species for aquaculture in the southern California and Baja California, Mexico are white sea bass (WSB; *Atractoscion nobilis*) and California yellowtail (YT; *Seriola lalandi*). Both are highly valued commercial and sport fish and are considered an excellent food fish. White sea bass are currently cultured by HSWRI for stock enhancement. The WSB hatchery in Carlsbad, California is capable of producing an excess of fingerlings required for the stock enhancement program and there is great potential and interest in the commercial culture of the species in offshore net cages. HSWRI is currently culturing YT experimentally, including test runs in offshore cages in northern Baja California, Mexico where there is also great potential for expansion.

Both of these species are carnivorous as are most of the popular marine food fishes. It is widely recognized that as aquaculture continues to grow, the fish meal and oil used in aquaculture feeds will become more costly and ultimately limiting as a resource. In this context, California state law pertaining to marine aquaculture facilities currently states "to reduce adverse effects on global ocean ecosystems, the use of fish meal and fish oil shall be minimized. Where feasible, alternatives to fish meal and fish oil, or fish meal and fish oil made from seafood harvesting byproducts, shall be utilized . . ."

Since 2008, U.S. soybean farmers have been funding a nutrition research project at HSWRI in collaboration with Dr. Allen Davis of Auburn University. This research involves a series of feeding trials with WSB and YT toward the ultimate goal of being able to replace a significant percentage of fish meal with soy-based products. Initial trials were designed to develop a basic practical diet that could then be utilized to identify upper limits for the inclusion of soy products and minimal levels of fish meal.

Using the initial formulations we identified practical levels for lipid and dietary protein. This was then followed by studies designed to evaluate the replacement of fish meal with soy products and the influence of limiting nutrients. Hence, we have been able to develop a practical research diet formulated to contain 40% protein and 10% lipid for WSB and 48% protein and 14% lipid for YT. Using the developed diet, we have determined that we can reduce fish meal from 55% of the diet to around 10-20% of the diet for both species using soy as the replacement protein. The next set of studies was

(For further information on this project, please contact Mr. Mark Drawbridge, Senior Research Scientist & Aquaculture Research Director, Hub-SeaWorld Research Institute at mdrawbridge@hswri.org and/or Mr. Dave Jirsa, Research Biologist at djirsa@hswri.org)

MARKETING:

PROMOTING YELLOW PERCH PRODUCTION IN INDIANA:

The first involvement Indiana soybean farmers had with yellow perch was to convene an Indiana aquaculture advisory council to evaluate our initiative and help provide guidance. This council identified yellow perch as one of the species favorable to culture in Indiana. Shortly after identifying yellow perch as a species of interest, our soybean association conducted a market research study to determine the potential interest for yellow perch (and other species) farmed in Indiana. We interviewed restaurants, groceries and wholesalers to determine what market demand for farm-raised yellow perch would be. The interest for yellow perch would be significantly increased in all three venues if the product were marketed as locally-raised.

Currently, we are funding nutritional research through Purdue University to evaluate soy protein concentrate as the primary protein source in diets for yellow perch. Previous soy-based research with yellow perch has indicated a ceiling of about 30% soybean meal in diets specifically formulated for yellow perch. The soy protein concentrate study was initiated to determine if more fish meal can be replaced by soy protein concentrate. This study was slated to be completed by September 30, 2009, but a fish kill at Purdue has necessitated a no-cost extension. Growth data will be available upon completion of this trial.

Our association is also working with Bell Aquaculture (currently the only known producer of yellow perch in Indiana). Our first program with Bell Aquaculture was to provide yellow perch for the annual Purdue Ag Alumni Fish Fry held in February of 2009. We provided over 700 pounds of Bell yellow perch fillets for this event that served approximately 1,500 people, including the governor of Indiana. This event will be repeated in 2010.

We also have begun a research relationship with Bell Aquaculture to test soy-based diets on a commercial scale. Currently, a yellow perch diet is not commercially available, so the industry typically feeds a trout or salmon diet. Yellow perch have a much lower protein requirement (30-38% protein) than trout and salmon (40-46% protein), thus

these diets are over-fortified with protein. We worked with Dr. Paul Brown of Purdue to formulate a 38% protein diet that contains 25% soybean meal. This will be the first "yellow perch" diet tested by Bell Aquaculture, and to our knowledge, by any large commercial yellow perch producer. This is considered the beginning trial that will be expanded in 2010 to further refine the commercial diet and come up with the best formulation, which maximizes soy usage, to make available to the feed industry.

In 2010, we will conduct a yellow perch genetic selection project to determine if certain strains of yellow perch are more accepting of soy-based feeds. This trial will be conducted at Purdue and is being co-funded by USB and several other QSSBs.

(For further information on this project, please contact Dr. Steve Hart, Director of Aquaculture, Indiana Soybean Alliance, at shart@indianasoybean.com)

POLICY:

The American Soybean Association (ASA) represents 22,000 producer members on national issues of importance to all of America's 600,000 soybean farmers. Of the several issues they promote to the Congress, two are of special interest to both the domestic aquaculture industry. They include support for the passage of an industry-friendly National Offshore Aquaculture Act and, most recently, support to develop an environmentally sound and economically sustainable aquaculture industry in the Gulf of Mexico exclusive economic zone (EEZ). ASA has also recommended to NOAA and USDA that they build on the Plant Protein in Aquafeed (PPA) Strategic Research Plan and put in place mechanisms for coordinating and realigning aquaculture research to meet the needs of the rapidly developing aquaculture industry. (See separate report that describes the PPA program in more detail.) To accomplish this goal, ASA continues to support a $10 million competitive research program at the USDA National Institute for Food and Agriculture on alternative aquaculture diets. ASA also encourages federal funding for research that would optimize the use of soybean protein and oil in aquaculture feed

ASA's support for these two initiatives began in April 2006, when ASA staff gave a presentation to the Senate Committee on Commerce, Science and Transportation. Emphasis was placed on the importance of offshore aquaculture to the United States and the contribution it can make to creating more demand for U.S.-grown soy. They were guided by an ASA's policy that stated "U.S. soybean farmers strongly support the expansion of U.S. aquaculture, which offers opportunities to replace imports and meet growing demand for a safe, domestically-produced supply of seafood." Several months later, staff met with Congressional staff and USDA officials to support the importance of aquafeed research as well as offshore aquaculture.

Since these initial meetings, ASA's Washington representative and farmer-leaders have:

- Met with Secretary of Commerce Carlos Gutierrez and other officials to discuss the Administration's agenda to support offshore aquaculture.
- Participated in the Department of Commerce's first-ever National Marine Aquaculture Summit.
- Provided comments to the Minerals Management Service (MMS) of the U.S. Department of the Interior in support of open ocean aquaculture within MMS leases in U.S. federal waters.
- Supported the Obama Administration's budget request for aquaculture research that could increase demand for soybean meal in aquafeed.
- Expressed support for NOAA's request for an increase of $2 million for aquaculture research.
- Recommended to the President's Interagency Ocean Policy Task Force that USDA implement a $10 million competitive program, with the goal of creating the scientific basis to facilitate the development of diets for any species of fish of local or global interest from alternative protein sources and to minimize any harmful environmental impacts
- Submitted comments to the Department of Commerce in response to a Federal Register notice for the Gulf of Mexico's Fishery Management Council's proposal. ASA took the position that "The United States can choose to benefit from the employment opportunities, relief in the trade deficit, and food safety benefits surrounding a viable domestic aquaculture industry."

In summary, soybean farmers have aggressively supported the development of offshore aquaculture, more federal funding for alternative plant sources of protein for aquafeeds, and greater cooperation between federal agencies to accomplish this research.

(For further information on this project, please contact Ms. Beverly Paul, ASA Washington Representative, at bpaul@gordley.com.)

SPECIAL INITIATIVES:

PLANT PRODUCTS IN AQUAFEED WORKING GROUP:

Globally, the production of aquafeeds is one of the fastest expanding agricultural industries in the world, with annual growth rates in excess of 30% per year (FAO, 2009). As aquaculture grows, so grows demand for feeds for these species and aquaculture is the fastest-growing animal food production sector (FAO, 2009). In the wild, many fish species consume high protein, high energy diets so commercial diets have relied heavily on fish meal and fish oil as protein and energy sources.

A consensus on all sides of the debate over the sustainability and impacts on the environment of both aquaculture and capture fisheries (Goldburg, 1997; Naylor, 2000; http://www.worldwildlife.org/what/globalmarkets/aquaculture/dialogues-salmon.html) is that aquaculture diets that rely less on the use of lower trophic level fish are key to the sustainability of aquaculture.

For more than 15 years, soybean producers have recognized the opportunity presented by this demand for high quality protein for aquaculture diets. But formulating feeds for fish has proven to be particularly challenging because most of the initial work was based on principles that evolved with domestication of terrestrial animals. This resulted in overlooking a numbers of issues and factors including: the large number of species and, therefore, a dilution of research efforts; evidence that fish may have conditional requirements related to the environment or during some part of their life stages; dietary requirements for nutrients not usually required by terrestrial animals; high variability and poor characterization of feed and feedstuffs which has diminished the reliability of estimates of nutrient requirements and the quality of data from feeding trials; and the poor definition of growth potential of various fish species/strains under different environmental conditions which has resulted in the absence of proper yardsticks by which to assess performance.

Given the confluence of interest of the environmental community, aquaculturists and the aquaculture feed industries in finding alternatives to fish meal and fish oil for use in aquaculture diets, and given the scientifically interesting and complex research issues surrounding understanding the wide spectrum of response to all alternatives to fish meal, an international group of researchers came together informally in 2005 to form the Plant Products in Aquafeed (PPA) Working Group. The group recognized that it would take a well-coordinated effort across disciplines nutrition, physiology, genomics, taxonomy, bioinformatics - to have the basic understanding of the fish, the plants and the ecosystems in which they live.

PPA works with the Federal agencies and with Congress to inform them of the opportunities for U.S. agriculture - crop and fish producers - of a sustainable, diverse, U.S. aquaculture industry. A sustainable – economically and environmentally – U.S. aquaculture industry, both on and offshore is dependent upon that would facilitate the development of highly digestible diets in various environments for diverse species.

To date, PPA has:

- proposed an interagency (USDA and NOAA) effort to conduct research on alternative diets; these agencies announced their cooperation in 2007;
- collaborated with USDA and NOAA to host technical sessions at Aquaculture America on alternative diets (2008-2010);
- to update the National Research Council's Nutrient Requirements of Fish (1993), worked to identify funding in the agencies; 5 members of the panel are active PPA members;
- published in peer reviewed journals, a review of understanding of plant-based aquaculture diets and a strategic research roadmap outlining research needed

to develop the sound scientific basis on which to develop aquaculture diets (www.aquafeeds.com);
- worked with ASA to draft language on alternative diets that has been included in draft legislation on offshore aquaculture; and
- Through ASA, proposed a $10m competitive research program on alternative aquaculture diets.

(For further information on this project, please contact Dr. Diane Bellis, Director, Federal Research Programs, AgSource, Inc., at Dbellis@agsourceinc.com)

TRADE RELATIONS:

USB-AQUACULTURE INDUSTRY COALITION:
The USB-Aquaculture Industry Coalition is represented by American soybean farmers and processors, aquafeed millers, supplements and equipment manufacturers, fish farmers, aquaculture association officers, government officials, and federal, university and private researchers involved in aquaculture. The Coalition is primarily an educational forum for the sharing of ideas and defining problems on which we can work together to solve. Our mutual goal is to build stronger our domestic soybean and fish growing industries and the many firms and programs that support them. The idea for a Coalition came from soybean farmers, who want to bring closer the day when soybean meal and soy protein concentrates can become an even more important nutritional, economical, renewable and environment-friendly source of protein in all fish rations. Initial support for the Coalition came from fish farmers, who want to grow and market more of their production in the United States, from the many industries that support them, and from state and federal researchers who want to solve problems that limit fish production and soy inclusion rates. Participation in our Coalition meeting has grown from 30 at the initial meeting in 2005 to over 100 at the 2009 event.

(For further information on this program, please contact Mr. Gil Griffis, Soy-in-Aquaculture New Uses Consultant, USB, at lggriffis@embarqmail.com)