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AQUA Culture AsiaPacific

Aquafeeds in Asia

- Industry faces rising costs
- 20 years on with aquafeeds in Thailand

Marine shrimp in Malaysia

Low stocking density as model in Bali

Insect protein meal in shrimp diets

Refining nutrient requirements in white shrimp

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WRITE TO THE EDITOR

We want to hear from you. Write your comments on the industry to the editor.

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Letters may be edited prior to publication

From the editor

The year 2008- Road blocks ahead, new route required

In the last issue of 2007, we reflected on the concerns impeding the industry during the year. Although the performance of many aquaculture commodities, in terms of volumes was good, there were issues on food safety and health. In this editorial, I ask you, what are we as *stakeholders* doing about it? – the role to be played by governments, farmers, suppliers, processor, exporter and importers should be cohesive.

Now that we have passed 2007, we can see a listing on contaminations for shrimp and fish products into the markets in the European Union through the RASSF. It showed the numbers of notifications on nitrofuran contaminations in Asian shrimp reduced to 22 as compared to 56 in 2006. These were notably in frozen black tiger shrimp originating from India, Bangladesh and Vietnam and in vannamei shrimp from China. Catfish contaminated with leucomalachite came from Thailand and China. In all, the number of notifications on malachite green reduced from 17 in 2006 (with 8 from Vietnam) to only 2 in 2007. The vigilance of authorities and that of the groupings of catfish farmers and processors seem to work well in Vietnam as there was no notification for malachite green from Vietnam.

In the industry review, readers will note that shrimp production will continue on its upward trend. Unfortunately, prices of shrimp have been low and the bad news is that an FAO report says, "Projected increases in farmed shrimp production will put new downward pressure on prices. The lack of demand growth in the US is expected to keep the level and value of imports to that market unchanged from last year, with some uncertainty arising from concerns over the quality of Chinese shrimp exports. In Japan, the tendency for fish imports to fall will include shrimp. On the other hand, import demand in the European Union continues to grow, especially for warm water shrimp but, in general, ample supplies from aquaculture are putting shrimp prices under pressure". Then industry players said there is the looming threat of a recession in the US, which will reduce confidence and have negative effects on the restaurant industry, which is the primary end user for most shrimp items.

At the same time, cost of production is increasing. In 1998, during the Asian financial crisis, we managed to export our way out. This time, we do not have this luxury, especially when producers are reporting higher local prices than international prices. To hedge against the declines in the US dollar, we should put more effort into increasing domestic demand. This is the best way to help local farmers. It is important to remember that there are many small farmers still involved in shrimp farming in Asia and the social impact of farms closing will be significant.

2007 witnessed the negative impact of biofuels on the aquaculture sector. This is expected to worsen in 2008. The major effect will be on raw materials for feed production (details on p16). As aquaculture feed and nutrition progress slowly, turning from art to science, the effects of biodiesel have certainly surprised us from the left field. Previous direction of replacing fishmeal with vegetable proteins seems dead in the water.

Perhaps this is a good time to go 'back to basics'. Science has taught us that animals have requirement for specific amino acids (and not protein in general) so where are we in amino requirements for Penaeids, tilapia, Pangasius and Lates spp.? There seems to be a dearth of information since the 1st phase of work was published in early 80s to the 90s. Comfortable profit margins have kept us complacent over the last 15 years. I remember recent conversations with industry recommending 'denser' monodon diets for the starter phases of vannamei culture. It may be working well but we could be performing better if we were formulating to vannamei's requirements. The critical question is – where is the science behind this recommendation?

With some hesitation of sounding like a broken record, both industry and academia must work together on amino acid requirements. This foundation is a basic requirement for proper least cost formulation and to improve the efficiency of all aquaculture feeds.

The new year is going to be an exciting one with three major events in Asia. For the feed and additives sector, there will be Victam and FIAPP in March in Bangkok. In May, the World Aquaculture Society returns to Asia in Busan, Korea and later in the year in August, we will move to Brisbane, Queensland for Australasian Aquaculture 2008. We hope that at all these conferences and tradeshows, we will learn more not only on the industry but help drive the industry in the right direction. As stakeholders, we should make it a point to attend and voice our needs.

Zuridah Merican

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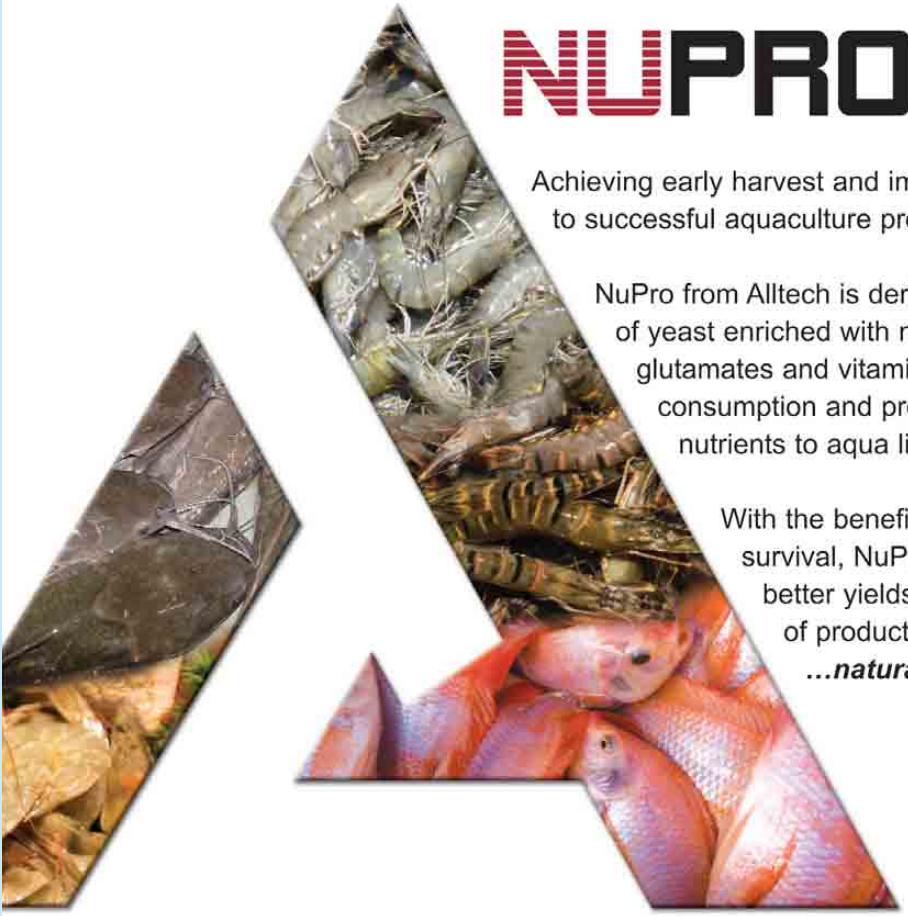

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Opinion on use of SDRC in fish feeds

In December, the European Food Safety Authority (EFSA) gave its opinion on the risk assessment of using bovine blood in feeds for fish. This was based on the report submitted by the European Animal Protein Association (EAPA) for 'reintroducing spray-dried red cells (SDRC) from cattle passed fit for human consumption into the diet of farmed fish in the European Union.

The EAPA represents companies specializing in the production and supply of high quality protein derived from animal slaughtered and passed fit for human consumption in the EU. Some of the products produced from non ruminant animals are currently used in human food, feed for food , pet animals and in pharmaceuticals for human use. The EAPA in supporting all the measures to protect public and animal health from risk of exposure to BSE agents, believes that circumstance have improved and that bovine SDRC can be reintroduced into farmed fish diets.

EFSA said that the scientific opinion of the Scientific Panel on Biological Hazard (BIOHAZ) noted that although the report is comprehensive, its qualitative approach did not fully take into account the uncertainties surrounding several of its risk parameters. Consequently, its conclusions may be overly optimistic. A human or animal health risk may arise if recycling of BSE-contaminated bovine SDRC occurs directly (bovine SDRC fed to cattle) or indirectly (fishmeal made from fish recently fed with BSE contaminated bovine SDRC given to cattle). This would be equivalent to feeding cattle by-products to cattle (intra-species recycling).

It added that the assessment of the BSE related-risk of bovine SDRC from slaughtered bovine animals considered fit for human consumption to be included in aqua feed is theoretically feasible, both semi-quantitatively and quantitatively by developing a probabilistic risk assessment model. However, key parameter limits of this model (i.e. endogenous bovine blood BSE infectivity and degree of contamination with CNS by current stunning and slaughter methods) can only be developed from expert opinion and judgement. There is currently no experimental data available.

Both the degree of uncertainty of this type of data (which would reduce the robustness of any risk estimates) and the extensive work that would be needed to produce such model makes its development unrealistic in the frame of this opinion. On the other hand and considering the current implementation of the EU feed-ban, the inclusion of bovine blood products in the authorized list of ingredients in fish feed would potentially limit the suitability of current available tools, to detect the presence of prohibited bovine by-products (i.e. SRM). Following this, the BIOHAZ panel recommends to develop and assess the outcome of a semi-quantitative or quantitative risk model of the BSE risk of bovine SDRC employed in aqua feed.

US-China agreement on food safety

In early December, authorities in the US and China reached an agreement on how to ensure that seafood imports into the US meet food and drug safety standards of American consumers.

China's food safety record has been a subject of scrutiny since June when the US Food and Drug Administration (FDA) announced a broad import control on farm-raised catfish and pangasius, shrimp, dace and eel from China. This arose because during targeted sampling from October 2006 to May 2007, FDA repeatedly found that cultured seafood imported from China were contaminated with banned antimicrobials such as nitrofuran, malachite green, gentian violet and fluoroquinolone. Several months of product recalls and doubts on quality of seafood from China followed. It was also reported that the total volume of China's seafood exports in 11 months of 2007 showed the lowest increase since 1999.

In this agreement, American inspectors will have access to Chinese factories. Chinese exporters to the US will register with the Chinese government and agree to annual inspections by China's office of General Administration of Quality Supervision, Inspection and Quarantine. This new agreement will include farmed seafood, such as shrimp and catfish. It will help to normalize the catfish trade between the two countries.

Unified standards for China's seafood production

China's first food safety production standards will be introduced in 2008 as part of its efforts to ensure food quality. This will cover 100 items from production, quality inspection, disease prevention and feed and drug usage, said ChinaDaily. At a conference in Beijing, experts in the country said that production comes from unregulated fisherman and small scale farms. A unified standard will help them to collect information on production and ensure product safety. In 2007,Shandong Province spent RMB 100 million (USD 13.6 million) to standardize 13,000 ha of farms. In 2008, the Ministry of Agriculture will build 200 pilot breeding bases in the country with supervisory systems on feed and drug usage. Currently there are 350 such bases in the country. Special inspections were launched in 2007 covering 19,600 farms.

US domestic catfish production declining

A Globefish report said that the US catfish production was lower at 200,000 tonnes in 2007. It added that the US catfish production is influenced by the decision of farmers to grow crops rather than catfish, in view of their increased demand for biofuel production.

Catfish imports, both *Pangasius* and *Ictalurus* totaled 31,969 tonnes in the first ten months of 2007 and these came from Vietnam, China and Thailand. This was 32% more than in the same period of 2006. Imports from China totaled 9,381 tonnes which almost 3 times the corresponding 2006 figure. However, in the past four months imports were a modest 1 000 tonnes, as catfish was put by the FDA on the list of five species, for which all the shipments from China are controlled.
Chinese exporters preferred not to ship the commodity, rather than be subject to lengthy and costly controls.

As the Chinese production is based on the *Ictalurus* species, US producers are unable to claim that it is a different species; therefore Chinese imported catfish can be sold in the USA under the channel catfish trade name. However, due to the COOL (country of origin) regulation, China as the producing country has to be indicated. Thailand is also expanding its catfish production. Exports from Malaysia declined as farmers found a more lucrative local market. At present, the price of Vietnamese frozen pangasius fillets is between USD 2.25-2.45/lb, while Chinese fillets are at USD 2.15-2.35/lb. Prices of catfish in the US market have gone up, though very slowly in the course of 2007 and a further increase is likely in the coming year.

SAP reviews industry progress in India

At its annual meeting held on 28 and 29 September 2007 in Chennai, the Society of Aquaculture Professionals (SAP) looked at the 'Progress through Partnerships' in industry. A total of 247 participants attended.

SAP President Srinivasan said that commercial shrimp aquaculture has to compete for funds with India's growing sectors such as information technology and infrastructure development. As industry is feeling the impact of the high cost of shrimp farming and the depreciation of the USD versus the Indian Rupee, he urged stakeholders to put their heads together to find solutions. G Mohan Kumar, chairman MPEDA (Marine Product Export Development Authority) said that when the agency was formed the primary aim was to earn foreign exchange and as this progressed, the focus is on employment generation. The aim now is to increase this from the current 3 million to 5 million people by 2015. It is also to increase export value from USD 4 billion to USD 6 billion. The vision is for India to be among top 5 exporting countries of seafood by 2015-2017.

In black tiger shrimp farming, presentations from industry pointed to several bottlenecks. Uday Ram Jothy said that infection with WSSV in production and in wild brood stock hindered increases in shrimp production in 2006. It was 115,700 tonnes in 2006, marginally up from 112,000 in 2005. In Andhra Pradesh, K. Madhusudhana Reddy said the most serious problems included loose shell and variability in sizes. Other presentations mentioned low survival, longer culture period to reach 35g shrimp and higher FCR. The future growth will depend on containment of these and production costs.

The Rajiv Gandhi Centre for Aquaculture (RGCA), the R&D arm of MPEDA has found that by rigorous PCR testing and individual spawning, it was possible to produce WSSV and MBV free black tiger shrimp seed from wild brood stock. In the long term MPEDA is interested in producing SPF black tiger shrimp, said Mr Thampi Samraj , Project Director. The likelihood of having commercial stocks of SPF black tiger shrimp in the next two years has increased due to the reported success of breeding programs by companies such as Moana and Hi Health Aquaculture in Hawaii. Even though commercial SPF black tiger shrimp would be available soon they are likely to be limited in quantities and locked in

integrated projects to be freely accessible to independent farmers said Dr A Victor Suresh.

Now it is possible to offer intellectual property rights of the Central Institute of Brackishwater Aquaculture (CIBA) to private companies or individuals for further testing and commercialization. These include joint research and projects such as genetic improvement, according to Dr AG Ponniah . Past achievements from CIBA have been PCR testing and a recent feed mill. Small Business Innovation Research Initiative (SBIRI) also provides funds to support start up and small firms in commercialization of technologies during initial and critical phases of testing ideas and developing a working model. This is to encourage people in aquaculture to think about business opportunities in biotechnology, said Dr George John of DBT (Department of Biotechnology). Newly established (2006) National Fisheries Development Board (NFDB) will invest money into ventures that directly or indirectly enable fisheries development including aquaculture said DR S Ayyappan, CEO. It has a budget of INR 21 billion (USD 525 million).

For more information and copies of the presentation on CD, contact SAP Coordinator Pramila Rajan at pramirajan@gmail.com

Brief news

Schering-Plough & Intervet

Schering-Plough Corporation has completed the acquisition of Intervet, part of Organon BioSciences N.V. to create a stronger combined company with broader human and animal health portfolios, an enhanced new product portfolio and increased R&D capabilities.

"The combination of Schering-Plough Animal Health and Intervet makes Schering-Plough a global leader in Animal Health," said Fred Hassan, chairman and chief executive officer, Schering-Plough Corporation. "This greatly increases the value we will bring to customers. We see this strong combined animal health unit as a key strategic part of our integrated business that will contribute to long-term high performance".

Alistair Brown, Managing Director of Intervet Aquatic Animal Health said, "We will be able to offer our customers an even wider range of science based aquatic animal health products and technical support for both prevention and treatment of aquatic animal diseases."

First to vaccinate barramundi

In Australia's Northern Territory, the Darwin Aquaculture Centre (DAC) of the Department of Fisheries has began a vaccination program to inoculate 200,000 juvenile sea bass *Lates calcarifer* or barramundi of 10-12cm against bacteria *Streptococcus iniae*. The DAC is the first to adopt the practice for barramundi in Australia. Twelve staff took six days on this inoculation program, handling 30,000-40,000 individual fish/day over a six-hour period. Inoculated fish are then delivered to local fish farms a few days later as stock for their ponds. Fish are grown to 2.5 to 3kg in 14-18 months, depending on culture conditions and temperature.

Department of Primary Industry, Fisheries and Mines (DPIFM) DAC senior aquaculture scientist Jerome Bosmans said that *S.iniae* is now considered to be the most significant bacterial pathogen affecting farmed barramundi in Australia. It has the potential to limit successful production of plate sized fish or fish for fillets both in freshwater and marine systems of farming. The vaccine costs about nine cents (AUD) per fish and is like insurance for fish farmers. It reduces the chance of the barramundi contacting the bacteria by 95-99%. (Intervet News, Dec 2007).

Fund to manage livestock and aqua business

Thailand feed producers have asked the government to set up a livestock fund to manage aquaculture and product businesses more effectively. According to the Bangkok Post, the president of the Thai feed mill association, Pornsil Patchrintanakul, has predicted that raw material prices such as maize and soybean meal will continue to rise because of the demand from biofuel producers. The suggested fund of THB one billion (USD 30 million) is to minimize effects if prices of livestock and shrimp were to drop. He also suggested that the government work at increasing maize and soybean planting and an additional 500,000 to one million rai (312,000-625,000ha) at an investment budget of THB 2 billion.

Rise in production in the Philippines

In 2007, the Bureau of Fisheries and Aquatic Resources (BFAR) estimated that the Philippines produced 4.9 million tonnes of fisheries products, valued at PHP 163.4 billion (USD 3.96 billion). It added that close to half of this came from aquaculture and may grow by as much 15% in 2008. Fisheries production in 2008 will be 5.3 million tonnes as the bureau had worked for the establishment of more mariculture parks and hatcheries. This increase in output was attributed to the culture of Pangasius catfish which enjoys huge demand from hotels and high-end restaurants and the Pacific white shrimp, introduced to revive the once robust local shrimp industry.

BFAR Director Malcolm I. Sarmiento Jr said the industry could also produce five million tonnes if the government would allocate an additional P170 million (USD 4.12 million) and there are no natural disasters or disease outbreaks. Currently, the Philippines is the eighth largest fish producer in the world, contributing to the total global production of 146.27 million tonnes, based on FAO statistics. The Philippines is also the world's second largest producer of seaweeds, with production reaching 1.39 million tonnes or 11.6% of the total world production of 12 million tonnes.

Hi tech farm goes from Africa to China

Sea Ark Africa will develop a 1,200 ha shrimp farm in an industrial farm in Coega, South Africa with a capacity of 20,000 tonnes of *Penaeus vannamei* shrimp, for export by 2014. The expansion followed the success of a pilot project with 200 ha. Sea Ark Africa is a 50:50 joint venture company between Sea Ark USA and Bosasa Group, Africa. The culture technology used is a proprietary indoor biosecure system using giant temperature controlled greenhouses developed by Sea Ark. Shrimp can grow 2-3 faster with lower feed conversion rates and with higher stocking density than any other system currently operating globally.

This Port Elizabeth based technology will be duplicated in Zhanjiang China under an agreement signed between Sea Ark Africa and a government agency, China Direct International Inc. The company will deploy specialists in China to design and build the facilities. The company said that it is likely to sign a deal with other international partners, including Saudi Arabia. (www.coega.co.za)

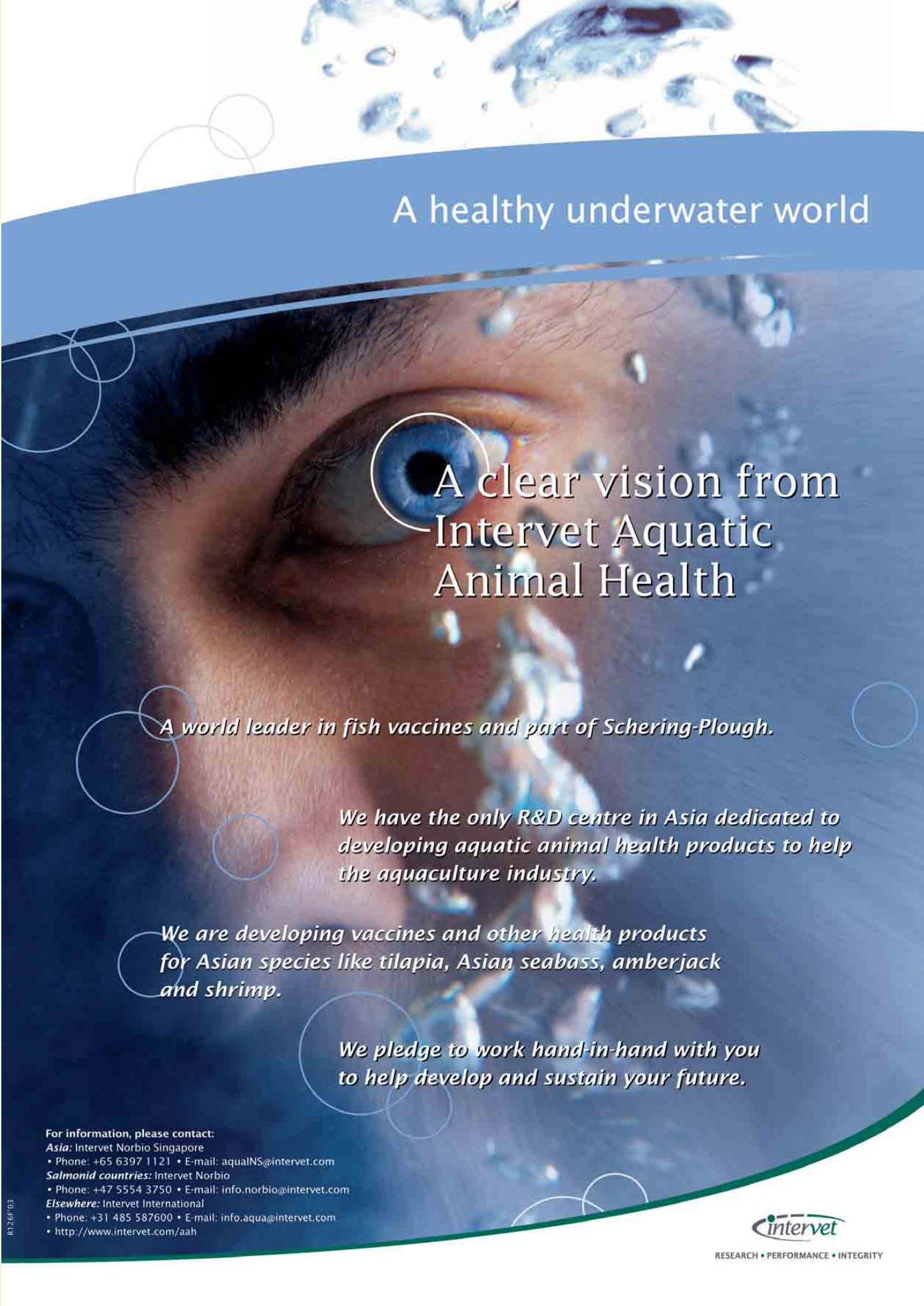
CP Prima links with local farmers

The world's biggest shrimp producer, PT Central Proteinaprima (CP Prima) said that it will spend up to USD242 million to strengthen operations of two subsidiaries in Tulang Bawang, Lampung to boost shrimp production, reported the Jakarta Post. The company will set a program to revitalize PT Wachyuni Mandira (WM) and PT Aruna Wijaya Sakti (AWS), formerly called PT Dipasena Citra Darmaja. The reopening of abandoned shrimp ponds will be done in stages and completed by mid 2009. Both subsidiaries operate hatcheries, ponds, feed mills and fish processing plants. In November 2007, their combined monthly shrimp production from 76,000 ha of ponds increased by 110% to 1,479 tonnes from 705 tonnes in May.

The company has reached an agreement with farmers grouped under PT Wachyuni Mandira (WM) in a 'core-plasma scheme' arrangement. WM acts as a nucleus providing loans, training and supervising the farmers. In turn, the farmers will sell their produce to the company. The agreement also establishes standard operating procedures for profitable, sustainable shrimp farming, according to a media statement. The farmers will now work on some 20,000 ha of dedicated land with some 3,220 shrimp ponds. CP Prima is currently in the process of securing the license to develop another 30,000ha of land.

New fish feeds factory in Mekong

In December, the Viet Nam Animal Husbandry CP Co. Ltd, part of the Charoen Pokphand Foods Ltd of Thailand, broke ground for building a fish feed factory in Ben Tre Province. This USD 70 million project is the largest direct foreign investment in the province. The factory, with an annual capacity of 384,000 tonnes of fish feeds is scheduled to begin production in September 2008. It plans to meet the growing demand for fish feeds in the Mekong Delta region.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Indonesia

A way to sustainability

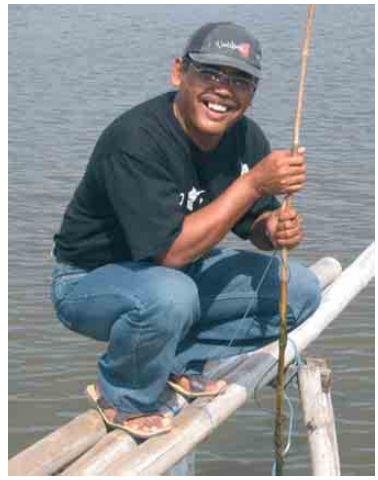
By Zuridah Merican

One should be content with lower stocking density, according to Setyo Irianto in Bali.

On Indonesia's Bali Island, farmer Setyo Irianto operates a cluster of ponds - 74 ponds in Singarajah and 26 in Negara. Since 2003, he has harvested 11 crops of *vannamei* shrimp. He started shrimp culture in 1995 with the black tiger shrimp *Penaeus monodon* and moved to the culture of *vannamei* shrimp after repeated failures with the black tiger shrimp. This scenario is typical in East Java where 90% of current shrimp production is vannamei shrimp. The average size of harvested shrimp is 40-50 pieces/kg. It is only in Sumbawa, NTB where some 10% of production is still black tiger shrimp and only of large sizes of 40g each.

In purchasing post larvae for his ponds, Setyo said that he merely picks up the phone to call his regular supplier whom he knows will provide quality shrimp. His regular supplier with hatchery facilities in three corners of East Java, Banyuwangi, Situbondo and Samudra has been with him for three years. However, if he needs to buy post larvae from a new supplier, he goes through the required checks on quality and disease status of shrimp. Prices are IDR 35 per post larvae (PL10) for those from imported broodstock and IDR 25 for post larvae from home grown broodstock. Post larvae prices depend on location. Each F1 post larvae costs IDR28 in Medan, IDR 30 in Lampung, IDR 35 in East Java and IDR 39 in Sumbawa. (one USD = IDR 9,426).

The stocking density differs with the locations of the ponds. In the 4,000m^2 ponds in Singarajah, he has stocked 100 post larvae/m^2. In the ponds in Negara, the stocking density is 70 post larvae/m^2 and is usually with post larvae from homegrown broodstock. This is low in comparison with many farms in Bali and Lombok where stocking density can reach 300 post larvae/m^2. In Sumbawa, stocking as high as 300-350 post larvae/m^2 or even up to 400 postlarvae/m^2, has been reported and harvests reached 45 tonnes/ha.



Setyo Irianto

Setyo uses feeds from three companies; PT Gold Coin, PT Suri Tani Pemuka and PT Global Luxindo, all locally produced. His ponds are divided into blocks and each block uses feed from a particular company. Setyo quoted a food conversion ratio (FCR) ranging from 1.3 to 1.5:1. Shrimp reach 56-62 pieces/kg at 100 days. After 110 days, shrimp reach 50 pieces/kg. Survival has been more than 100% and the average harvest was 7.7 tonnes/pond /crop (19.5 tonnes/ha). He has managed well with two cycles per year.

A. Faridi, Sales Manager at PT Gold Coin Indonesia's feed Mill in Bekasi said that in general, farmers culturing *vannamei* shrimp intensively will use their starter crumbles of their premium Supreme brand of feeds with more than 40 % crude protein. They will shift to the Forte brands which is specifically designed for *vannamei* shrimp culture for the rest of the culture period to harvest at 100 days.

During the trade show at Indonesian Aquaculture 2007, a farmer and feed dealer from Sumbawa said that the average growth

rate of vannamei shrimp fed feed with a low protein feed (35%) can be 0.17g/day whereas with higher protein *P. monodon* feeds (>40%), it can reach 0.23-0.25g/day. A key success in *vannamei* shrimp is a daily growth rate of 0.15-0.2g at a stocking density of 90 postlarvae/m^2 (Limsuwan, 2007).

To control water and pond conditions, Setyo uses a combination of locally produced probiotics. This is added after stocking and is continued on a weekly basis. He added that probiotics increase his cost of production. With this current combination, he adds IDR 285 to the cost of production for each kilogram of shrimp. Previously, his costs for probiotics was more than IDR 500/kg.

"I have calculated that my cost of production is IDR 25,000/kg if the culture period is 100 days and IDR 27,000 if this is extended to 120 days. The costs of production have been increasing. Before the huge increases in fuel costs, costs were only IDR 20-22,000/kg".

Shrimp were sold at IDR 35,000/kg after 100 days of culture in August 2007. Larger shrimp (50 pieces/kg) were sold at IDR 38,000/kg. Setyo is also very wary of the added risks when the culture period is extended. He added, "I am lucky that the market in Bali prefers small shrimp and I can sell direct to the local market. Larger shrimp are sold to brokers".

In the ponds in Negara, a major challenge has been diseases such as white spot syndrome virus (WSSV), Tuara Syndrome (TSV) and others and affecting shrimp at 40 days to 2 months. This was attributed to the much colder weather conditions in Negara as compared to Singarajah. In a recent incident, he lost shrimp of 3 g size to diseases and restocking was done again in September. According to Setyo, at post larvae from homegrown broodstock were more resistant to changes in temperature in Negara.

When we talked at the Indonesian Aquaculture 2007 show in Bali in July 2007, Setyo also said that he is happy with the 100 ponds under his charge. This is a manageable level. He also had the following advice on shrimp farming in Bali;

"Do not be too emotional, one must have self control;"

"Do not be too greedy, keep stocking density to a controllable level;" and

"Keep your dreams to an achievable level, do not dream too high."

"As the saying goes, '*sedikit sedikit, lama lama jadi bukit*' (translated – a little bit here and there will eventually become a hill or mountain). "All these are essential to have a steady culture system without any use of antibiotics. Only when this is sustainable can we pass on this business to the next generation", said Setyo.

Marine shrimp in Asia

Adverse trade conditions, low prices and the generally higher costs of production did not constrain shrimp production which continued on its upward trend to 2.4 million tonnes in 2007. More vannamei shrimp was cultured at 61% of production and there is the likelihood of this increasing further in 2008. AAP reports

Production trends

China remains the leader with estimates of production of one million tonnes (Glitnir, 2007). The Philippines is bouncing back with estimates of 45,000 tonnes. Production increased in Malaysia at 70,000 tonnes of shrimp in 2007 (see next article). In Indonesia, industry indicated that in 2007, 180,000 tonnes was produced by intensive and extensive farms (36%) and the balance was from integrated shrimp farming. The 53,000 (22.6%) tonnes of monodon shrimp production was mainly from extensive farms.

Demand and low prices

Surplus in production has lead to low prices. In the first ten months of 2007, Globefish (2007) reported that US imports declined by 2.3% compared to the same period in 2006, despite lower domestic supply. From Asia, Thailand was the largest supplier. Imports from Mexico rose by 54% whilst US imports from China were reduced by 24% because of the FDA alert in June. Shrimp imports declined by 9% in Japan while imports rose in EU markets. The 8% increase in imports in France came largely from Ecuador where production in 2007 has reached its 1998 level (130,000 tonnes) after years of combating WSSV.

In Thailand's Mahachai market, year end prices for large black tiger were THB130/kg for 40 pcs/kg (USD 3.94) and THB83 (USD 2.5/kg) for 100 pcs/kg of white shrimp. In contrast, prices were higher for white shrimp in Vietnam quoted at USD 2.82/kg for 100/kg head-on shrimp. In Indonesia, white shrimp were sold locally for IDR30,000 to 40,000/kg (USD 3.17-4.23/kg). Prices for Chinese shrimp dropped to less than RMB18/kg for 60pcs/500g (USD2.5/kg, Infoyu, 2007). Local prices were higher than international prices.

These generally low prices were further aggravated by the higher value of regional currencies against the US dollar. The Thai baht appreciated by more than 8%, thus reducing the competitiveness of Thai shrimp despite innovations, upgrading of skills, and reducing costs, according to the Thai Seafood Association. The Chinese Yuan has appreciated 6% since 21 July 2005 when China adopted a flexible policy on its currency exchange rate, according to Infoyu (2007). The Chinese shrimp industry does feel some pressure from the RMB appreciation, but experts said that the negative effect of this can be mitigated as China has abundant rural labour resources and is moving to focus more on exports of value-added shrimp products.

Case for vannamei shrimp

Vietnam, the major supplier of large size monodon shrimp now faces competition from producers of large size vannamei shrimp from Thailand and Indonesia. In 2007, 85% of production was black tiger shrimp. Japan, once a large market for this shrimp now prefers white shrimp. In Vietnam Net, Prof Dr Nguyen Huu Dung, Vietnam Association of Seafood Exporters and Producers (VASEP), said that the situation has become quite different as the quality of vannamei shrimp is the same as black tiger shrimp, while prices are weak. As the result, Vietnam's black tiger shrimp is in danger of being weeded out from import contracts. Vannamei shrimp culture is now limited to the central and northern regions from Quang Ninh to Binh Thuan. Industry wants the authorities to review the ban on its culture in the Mekong Delta.

At an industry meeting in India (see page 5), the concern was that production could remain stagnant at 150-160,000 tonnes of black tiger shrimp. Ali Hussain, Bismi Aquaculture in Tamil Nadu, cited problems such as higher FCR from 1.4 to 1.8, low survival rates (47%) and longer culture period (155 days vs 125 days to produce 35 g shrimp). Others cited low quality post larvae and infections with WSSV and loose shell disease. Stakeholders have asked that India allow the vannamei shrimp to be cultured. To overcome apprehensions in the industry, a suggestion was a selective introduction into the 20% of farms which are suitable for its farming.

Outlook

In the Philippines, vannamei shrimp has a local market mainly around Metro Manila, Cebu, Visayas and Davoa City, Mindanoa with higher prices as compared to international markets. Production could show a large increase when institutional and corporate farms start its culture. Industry is of the opinion that the level of change will depend on domestic demand and prices and how fast the processing industry gears up its value adding capabilities. Currently, several vannamei hatcheries are coming on line in 2008 in addition to those already set up in late 2007. Monodon culture is largely semi intensive at average stocking density of 10/m^2 and will drop because of increasing costs and lower farm gate prices (pers comm.; C.Co, 2007; W. Kramer, 2007).

In Malaysia, barring disease problems, production can rise to 100,000 tonnes in 2008, said Tuan Syed Omar, Malaysian Shrimp Industries Association (MSIA). The Thai Shrimp Association plans to reduce shrimp production by 20% in 2008. It will also focus on quality, not quantity.

Vietnam is gearing production to reach its target of 460,000 in 2008. In Vietnam, producers have been told that the only way of improving its competitiveness is by lowering the production costs to VND 50,000/kg for black tiger shrimp. Vietnam is also seeking markets other than Japan and the US. The road to reaching its target of 330,000 tonnes in 2007 has been difficult in Indonesia because of low prices coupled with market demands on food safety and traceability. In 2008, the target is 490,000 tonnes (Trobos, 2007) and efforts will be through revitalization of abandoned and failed farms. The maximum stocking density is 60pcs/m^2 and by 2010, the target is to revitalize 1,000 ha. On top of this, CP Prima's Dipasena in Lampung will start full production from early 2008.

Table 1. Actual production in 2005* (FAO, Fish Stat 2007) and industry estimates on farmed shrimp production in 2007-2008

Country	2005*	2007	2008	Ratio vannamei : monodon	
				2007	2008
China	1,024,949	1,000,000[a]	1,045,000[b]	65:12	-
Thailand	375,320	520,000	410,000	95:5	95:5
Indonesia	279,375	234,000	250,000	73:27	80:20
Viet Nam	327,200	320,000	350,000	15:85	20:80
India	143,170	132,000	150,000	-	-
Malaysia	33,364	70,000	100,000	80:20	90:10
Philippines	37,720	45,000	55,000	35:65	45:55
Bangladesh	63,052	60,000	80,000[c]	-	-
Others (Taiwan, Brunei)	15,236			-	-
Total	2,299,386	2,381,000	2,440,000		
Total of *P. vannamei*	1,323,319	1,460570			
Latin America	282,030	454,000	300,000[c]		
Global Total	2,333,709	2,835,000	2,740,000		

Sources: [a]Glitnir Seafood report 2007; [b]based on 4.5% growth, [c]projections for Honduras, Ecuador, Mexico, Brazil by Intrafish, Vol 5 (10), 2007.

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Marine shrimp in Malaysia

by Subramaniam Kathamuthu

An opportunity to return to black tiger shrimp culture

Production has increased substantially in the last two years, mainly due to the farming of the vannamei shrimp. With availability of domesticated and specific pathogen free broodstock of the black tiger shrimp, industry wants to return to this species to market premium quality products.

In April 2005, the Department of Fisheries (DOF) allowed the culture the white shrimp, *Penaeus vannamei* and since then, most farmers in Malaysia have been swept by the farming frenzy created by this species in the rest of Asia. Total production was estimated at 70,000 tonnes in 2007, with 80% comprising vannamei shrimp. This increased from a total production of 60,000 tonnes in 2006. In comparison, production was only 33,000 tonnes in 2005, largely of the black tiger shrimp.

In 2004, the Department of Fisheries (DOF) had developed targets for aquaculture development in the country. This was part of the strategy to use shrimp aquaculture as a third engine of growth in agriculture. The target for production of the marine shrimp was set at 180,000 tonnes by 2010. This current increase in production is helping the country in achieving this target. Malaysia is very proud to claim as one of the pioneers in the region to produce Specific Pathogen Free (SPF) black tiger shrimp *Penaeus monodon*. This is very encouraging and will enable the country to increase the share of black tiger shrimp production from the current 20% to 50% by 2010.

Black tiger marine shrimp

Despite adversities such as poor quality post larvae from wild caught bloodstock and multiple viral infections in shrimp, many of the major commercial marine shrimp farms in the country still pursue the culture of black tiger shrimp. These include Black Tiger Aquaculture Sdn. Bhd (BTA), Agrobest, JW Properties, Kedah Aquaculture and Gropoint. Beside them, there are a few small scale farm operators who continue with black tiger shrimp culture and are not willing to shift to vannamei shrimp culture.

However, among them, only BTA has successfully developed SPF stock of the fourth generation, which is now commercially viable. Some of these large farms are still in the process of developing domesticated stocks using brood stock of African origin. The aim is to produce high health marine shrimp post larvae.

Culture practices have changed. The stocking density has been reduced to 25 to 30 post larvae/m^2. Harvest sizes are usually 40 pieces/kg. The cost of production at 70% survival is high at MYR14/kg (USD 4.11/kg). Shrimp is processed for export market as head on shell on, headless, peeled or tail on products. Black tiger is also marketed live or chilled to neighbouring Singapore.

In the culture of this shrimp, farmers adhere closely to good management practices such as implementing biosecurity measures with tire bath at the farm entrance, metal fencing and overhead netting on the ponds. Farms use either post larvae produced from SPF broodstock or those imported from Africa or locally caught broodstock. All these are used after a thorough screening process. Culture using post larvae from SPF broodstock provides better survival rates (80%) and higher production (5 tonnes/ha/crop) as compared to conventional post larvae with survival rates of 60% and lower yields at 4 tonnes/ha/crop.

Vannamei shrimp

This is now commonly cultured in all parts of Peninsular and East Malaysia. The government was very cautious in mandating its culture. It stipulated that only SPF *P. vannamei* broodstock imported from Hawaii and Florida be used for post larvae production. Today, farms adopting good management practices and using strictly shrimp post larvae from these broodstock are enjoying bountiful crops from high stocking density.

Currently, stocking density ranges from 70 to 100 PL/m^2. Harvest sizes are 50 to 70 pieces/kg. The cost of production with 70% survival is MYR 9/kg (USD 2.65/kg). Shrimp is commonly marketed in chilled form in the wet market or supermarkets, usually at MYR 11/kg (USD 3.23/kg) for size 70 piece/kg size. This shrimp has replaced captured shrimp among households. However, similar to the black tiger shrimp, it is also sold to processing plants to be processed as head on shell on, headless, peeled and tail on products for export.

Generally, farmers carry out a partial harvest system where about 30% of the stock is harvested beginning from day 90 of the culture operation with 70 PL/m^2 stocking density while the balance is retained to produce larger shrimp, harvested around day 120. Farmers stocking 100 PL/m^2 increase their partial harvest to 50% while maintaining the remaining stock to be harvested at around day 120 of culture operation. Farmers stocking 70 PL/m^2 have an average yield of 10 tonnes/ha/crop while those stocking higher (100 PL/m^2) increase their yield to 15 tonnes/ha/crop. The majority of the farmers have opted for this white shrimp, although profit margins are low, so that they can sustain operations with higher production volumes.

The culture is popular despite some farmers encountering severe disease problems caused by TSV (Taura Syndrome Virus) and WSSV (White Spot Syndrome Virus). TSV and WSSV are very prevalent in the northern region of Peninsular Malaysia, and is spreading slowly to the south. Sarawak in East Malaysia was the last to introduce *P. vannamei* culture and has not been spared from TSV and WSSV infections.

Strengths

As a general rule, Malaysian shrimp farms opt for hatcheries with good management practices and those with stringent biosecurity and brood stock screening processes are sought after. Proper screening of locally available broodstock to produce high health marine shrimp post larvae is strongly encouraged by the authorities. Farmers are even willing to pay higher prices for high health PL (MYR 0.035 each), which is three times that for conventional post larvae.

With the high stocking densities in vannamei shrimp culture, the adoption of culture technologies such as zero water exchange has increased. Many farmers have opted for probiotics to maintain pond water quality. Organic shrimp farming was introduced recently but it is still limited to few operators.

The government is also emphasizing sustainable marine shrimp farming practices such as adopting mangrove friendly shrimp farming methods or using biosecurity measures such as overhead netting over the ponds and disinfectant baths at farm entrances to limit the spread of diseases. Farms with good aquaculture management practices are also rewarded with 'SPLAM' or 'SAAB' certificates under the farm accreditation scheme.

Threats from diseases

Disease continues to be a major threat. Besides the major viral disease infections in marine shrimps, reports on the emerging disease called Monodon Slow Growth Syndrome (MSGS) is on the rise. Black tiger shrimp in affected ponds grow abnormally slow and show a large size variation. This was first noticed in Thailand in 2001 when farmers found an unusually slow and uneven growth of their shrimp. Shrimp reached an average size of 12.5g instead of the regular size of 24 to 40g after 4 months of culture (Withyachumnarnkul, 2005).This is different from the stunted growth caused by Monodon baculovirus (MBV) or Hepatopancreatic parvovirus (HPV). A new found virus, Laem-Singh virus (LSNV), first observed in 2006, could be associated with MSGS.

The good news is that, Monodon Slow Growth Syndrome has not been found in farms adopting GMP, GAqP or using SPF PL. Hence good aquaculture practices and good management practices are well accepted among marine shrimp farmers in the country to avoid the existing and emerging viral disease problems.

Investment opportunities

To encourage private sector participation in the development of the industry, several incentives for large scale commercial farming have been introduced. About 39 sites have been identified and designated as Aquaculture Industrial Zones (AIZ). These AIZ are allocated for a systematic development of sustainable marine shrimp farming. In these zones, the government will provide the basic infrastructure (roads and electricity). Bottlenecks identified by industry such as shortage of suitable land for marine shrimp farming, disease outbreaks, quality seed supply, high cost of feed, fuel and labour are being addressed. In R&D, there are special schemes. Commercial banks are encouraged to provide financial support while the government is also providing some tax incentives. Such a move will definitely help to reduce costs of production and improve competitiveness.

The major issue in the farming of both species has been the rising production cost. This increased from MYR 9/kg in 1997 to MYR 14/kg in 2007, particularly with increases in fuel and feed costs. Since the vannamei shrimp has a short history in Malaysia, it is difficult to compare costs but the profit margins are definitely low at MYR 2/kg. So, how are Malaysian shrimp farmers going to face these challenges? As was done with white shrimp culture elsewhere, increasing survival rates and yields with SPF stock to reduce disease outbreaks is the way forward. Most farmers are well aware of this and are trying their best to do this to stay in business.

Mr. Subramaniam Kathamuthu is currently Development Manager in BTA (Black Tiger Aquaculture) Group. Previously, he was Head of Brackishwater Aquaculture Research Centre, Gelang Patah, Johor, Department of Fisheries Malaysia.

13th DSM Conference

Bringing to industry recent developments in shrimp culture, biotechnology in shrimp disease, nutritional genomics and balancing feed formulations with nutrient requirements.

The 13th annual DSM Nutritional Products conference was held on 23 November in Bangkok. This year, participation mainly from industry in Thailand increased to 300. Continuing from last year when he adopted a holistic approach to challenges facing the industry, Dr Jacques Gabaudan, DSM Aquaculture Centre Asia Pacific arranged for speakers from Thailand, France, Mexico, Greece, USA and Switzerland to share with industry research findings which will assist them to improve performance and production efficiency.

"Our aim is simple, we want to be the conduit for the transfer of scientific and technology research to the fish and shrimp farming industry. These are critically important if, we are to meet the challenges ahead together. No doubt that technologies presented will change drastically the way we do things in aquaculture."

The one day event covered topics from the status of the farmed shrimp industry in Thailand and detection and protection methods for shrimp diseases to contemporary issues in feed formulation and feed technology. Information on feed advances in shrimp nutrition, feed ingredients and processing is presented in the section on feed technology, from page 23).

A changing Thai shrimp industry

Dr Chalor Limsuwan, Kasetsart University, Thailand opened the conference with an insight into the situation of the shrimp industry in Thailand and the future trends. In comparison with other top producers in the region, Thailand continued to lead in farmed shrimp with production of 450,000 to 500,000 tonnes in 2006. However, in contrast with the early years in commercial farming, black tiger shrimp only accounted for 13,500 tonnes of the production in 2006.

What led to the low production of this shrimp was the change to intensive systems since 1986. During that year, stocking was 30-40 post larvae/m^2, and shrimp easily reached 33g within 4 months. However, by 2004, it was difficult to get such good growth. Attributed to the disease Monodon Slow Growth syndrome (MSG) growth decreased to yield as low as 13g for the same period. It was this debacle that pushed for the introduction of the white shrimp *Penaeus vannamei*. It was simple to start vannamei farming as the species has been genetically improved over several generations.

The structure of farms has changed too. Prior to 2000, when black tiger shrimp was the dominant species, there were 35,000 farms. When slow growth in shrimp occurred, several small scale farms stopped operations or shifted to another aquaculture business. By 2002, small scale farms could not compete with the more efficient large farms in intensive culture of the vannamei shrimp.

Dr Jacques Gabaudan (left) and Styliani Adamidou

DSM at the conference. From left: S. Sawant, India, Ian Patridge, Singapore and Robert Redman, Thailand

At the same time, increasing supply has brought down prices. Prices for 40 pcs/kg hovered around USD 3/kg. For the industry in Thailand, a double blow was that shrimp from Thailand, be it monodon or vannamei shrimp fetch the lowest prices among producers in the region. Dr Chalor showed charts that for every size group, prices were lowest for Thai shrimp as compared with those from other countries in the region. In the first six months of 2007, the price for 40 pcs/kg declined to as low as THB130/kg.

The current 10,000 farms operating now face a gamut of requirements of the global market; food safety, sustainable aquaculture, food quality, traceability, best aquaculture practices (BAP) and lately the Global Gap. These are added costs whereas shrimp prices are on the decline. Dr Chalor quoted costs such as USD400 for third party certification. In general, the smaller farms have found it difficult to meet all regulations. Some farms find these are too complicated and have ceased operations. He raised the issue of whether shrimp farming has become a risk for small farms but an opportunity for large farms that can meet standards. The question posed was whether these types of certification are technical barriers. According to the WTO (2006), 'the agreement on technical barriers to trade ensures that regulations, standards and testing and certification procedures do not create unnecessary obstacles to trade'.

"Whether black tiger or vannamei shrimp, the long term future is in the production of good quality and safe shrimp. The system should be able to trace from hatchery to table and we want to see the same standard used globally".

Today, the survival of small farms is now in increasing production efficiency and reducing cost of production, while concurrently modifying farms to meet the standards. This is easier said than done. The only farm continuing to culture large black tiger shrimp, Grand Sureerat Farm, has a good biosecurity program and uses gut weed *Ulva testinalis* as a natural feed source. The propagation of gut weed is carried out for 40 days and when 30% of the pond area is covered by the weed, post larvae are stocked. There is no feeding until all the gut weed have been eaten, usually by two months. In this way, feed costs are reduced.

The audience was also privy to some technical information in vannamei shrimp farming in Thailand. He said that postlarvae quality is related to broodstock quality and that shrimp should reach 10g in 60-65 days and 20g in 90 days when stocked at 80-100 post larvae/m^2. Aeration targets are more than 4 mg/l, alkalinity, more than 80 mg/l and pH 7.5 to 8.5.

"As vannamei farms can now target 30 pcs/kg , what position can the large black tiger shrimp have in international markets", asked Dr Chalor.

Feed manufacturers from Indonesia at the DSM conference. From left: Gede Suantika, PT Charoen Pokphand, P. Hidayat, Vice President PT Suri Tani Pemuka, Yohannes Irianto, DSM and Riduan Effendi, PT Cargill.

Both Ms Wansika Kiatpathomchai (right) and Dr Kallaya Sritunyalucksana (left) have won the L'Oreal Thailand, "Young Women in Science Fellowship" awards in 2005 and 2007 respectively. They are pictured here with Dr Sirirat Rengpipat, Chulalongkorn University

Biotechnology of protecting shrimp against viruses

Ms Wansika Kiatpathomchai from the Center of Excellence for Shrimp Molecular Biology and Biotechnology (Centex Shrimp), said that either PCR (Polymerase chain reaction), RT-PCR or nested PCR are used to detect diseases. She introduced loop mediated amplification (LAMP) assay as a novel method for disease diagnosis in shrimp using LFD (Lateral flow dipstick) which does not require expensive equipment such as PCR and electrophoresis equipment. The process takes only 1 hour as compared to 3-4 hours with PCR. The isothermal conditions means that a simple water or heating block will be sufficient.

The sensitivity can be improved by combining LFD with LAMP. In her work, she said that LFD will require only 5-15 minutes after RT-LAMP technique. She has used this effectively to develop a protocol method to detect occurrences of Tuara Syndrome Virus (TSV) and is currently using this to develop diagnostic protocols for white spot syndrome (WSSV) and hepatopancreatic parvovirus (HPV).

In new technologies for protecting shrimp against viral pathogens, **Dr Kallaya Sritunyalucksana** said that little has been done on shrimp responses to viruses. Most work has been on responses to bacterial and fungal infections. They have looked into recombinant viral proteins as an alternative strategy. Many scientific studies including their work, showed that an injection of WSSV structural proteins as a subunit 'vaccine' can protect shrimp against viral diseases. However, the mechanism of protection is still unknown. The dsRNA (double stranded RNA) approach has been shown to be effective against three unrelated viruses: WSSV, TSV and YHV. In addition, Dr. Kallaya and her colleagues have discovered a new shrimp WSSV-binding protein called PmRab7 that has some ability to protect shrimp from WSSV infection.

Uncertainties ahead with raw materials

In our last review on the aqua feed industry, feed producers explained how they handled rising costs of production as energy and fish meal costs escalated throughout 2006. In 2007, aqua feed producers faced a whole new gamut of problems. Bioethanol production in the US, Brazil, China and Thailand competed with feed industry for plant meals which in turn showed unprecedented price increases. In Asia, low international prices were adversely affected by a lower value of the US dollar. The onus is on feed producers to keep production costs low. AAP reports

In 2007, data on estimated feed volumes and calculated from fish and shrimp production showed aqua feed demand continuing on its upward trend. The significant increases were with shrimp feed in Thailand and feeds for the catfish in Vietnam. Marginal increases in shrimp feed production in Vietnam and that for the Philippines were due to the production of the vannamei shrimp. Low production due to diseases, poor seed stock quality coupled with the issue of food safety in some markets hindered the progress in industry in India and Indonesia (also see page 10). These developments obtained from industry contributions and media reports are described in the following sections. Recent developments in the sector in India were described in a previous article in issue November/December 2007.

Fish feeds production

Exponential growth in Vietnam

In mid 2007, the Vietnam Association of Seafood Exporters and Producers (VASEP) projected one million tonnes of catfish production for the year. This increased from 825,000 tonnes in 2006 and 400,000 tonnes in 2005. However, fish feed producers estimated that this will increase further. At an average FCR of 1.62, a conservative estimate on feed demand will escalate to 1,069,200 tonnes, assuming that only two thirds of fish production is with commercial feeds (Campet, 2007;Dung, 2007; Le et al., 2006).

"With this expected demand, feed mills then exploded in many forms even though we have issues such high costs of materials. The sector has become very competitive", said Vo Thi Kim Hang from Viet Long Feed Co with 90% of its aqua feed production as catfish feeds. With two new mills, it will increase capacity to 20,000 tpm from the current 9,000 tpm by 2008. Catfish feeds from Viet Long with 26% protein sell at VND 6,500/kg (USD 0.40/kg). Concurrently, the company is also carrying out trials on feeds for other freshwater fish and marine fish.

The potential aqua feed market in Vietnam has continued to attract foreign investments. The current number of feed mills for both fish and shrimp feed production was reported as 39 in 2006. China's Tongwei Group announced that it will build a factory to produce 300,000 tpy of fish feeds in Vietnam's southern Kien Giang province for distribution in the Mekong Delta and for export. Thailand based company Green Feed Vietnam Co Ltd started a 80,000 tpy shrimp, fish and livestock factory, adding to the 30,000 tpy capacity at its feed mill in the Mekong Delta. Japan's Higashimaru Feeds Ltd has invested in a 10,000 tpy catfish and shrimp feed factory, also in Tien Giang Province. By August 2008, CP Vietnam Livestock Ltd. Company will produce fish feed at its new 384,000 tpy factory in Ben Tre Province. Together with current upgrades and additions of new lines in existing mills, the calculated capacity can reach 1.5 million tpy of extruded fish feeds.

Moderate in Thailand

Freshwater fish production in Thailand increased to 580,000 tonnes in 2007 for tilapia, catfish, snakehead and non carnivorous species. Production was only 543,000 tonnes in 2006. However, industry estimates totaled only 456,750 tonnes demonstrating that some 30% of production used farm made feeds. Annual growth of the fish feed production was estimated at 11-12% growth but in 2008, fish feed production is expected to rise substantially with current promotions on the culture of a local catfish species. The country wide capacity for fish feeds is 100,000 tpm and reportedly only 50% of capacity is being utilized. Betagro, a large poultry integrator has a new feed mill with a capacity of 8,000 tpm for extruder feeds for the catfish, tilapia, catfish, herbivorous fish and pet food. Capacity may be increased to 16,000 tpm with a two new lines. The company wants to sell 12,000 tpm of fish feeds by 2008 (Feed&Livestock, 2007).

Slow in Indonesia

There are 20 fish feed producers with 600,000 to 700,000 tpy capacity of fish feeds mainly for the production of carps and tilapia. However, for the 12 feed mills in East Java, annual growth demand has been low at 15%. Cage culture in three large lakes in Java uses some 40% of the feed produced and as this market is being threatened by problems such as eutrophication of the water bodies, pollution from feed waste, agricultural runoff from the uncontrolled expansion of cage culture.

Shrimp feed production

Low demand in open market in Indonesia

Feed producers say production volumes are not good enough. They estimated that only 200,000 tonnes for the open market was produced by 26 producers and 110,000 tonnes was used by integrated operations. Despite official shrimp production data of 327,000 tonnes, this and export data showed that shrimp production has been lagging behind production targets. In contrast, some companies have reported good feed sales especially in NTB, Lombok, Bali and Kalimatan. They have reported production at more than capacity. There were also reports of feed imports from Thailand, Malaysia and Vietnam. CJ Feeds of Korea which started production in mid 2007 will expand with another line in 2008.

Feeding vannamei shrimp

A new demand was created in the **Philippines** when some farms shifted to farming vannamei shrimp. The country wide feed production for vannamei shrimp in 2007, is small, possibly at 9,000 tonnes at FCR 1.8 for 5,000 tonnes of shrimp. Vannamei shrimp culture was introduced in January 2007 but most feed producers had anticipated the removal of the ban and were ready with feeds specially formulated for vannamei shrimp as early as June 2006. Currently market leaders in the production of vannamei shrimp feeds are Santeh, Intaq feeds and HPFC whereas CP, San Miguel Corp (B-Meg) OFC, HPFC, Intaq and Santeh Feeds continue to lead in monodon feeds sales. Similar to the practice in other countries, some farmers use the more nutrient dense feeds for *P. monodon* for the early stages of culture and feeds specifically formulated for vannamei shrimp (32%-37% CP, 4% fat) for the grower

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stages. Similar to Vietnam, industry here expects production of monodon shrimp to decline in 2008 and vannamei shrimp production to increase and this will be reflected in feed sales.

More expansion

Local consumption of shrimp also fuelled feed demand. In **Malaysia**, it was through the growth vannamei shrimp culture. Demand picked up at 12,000 tpm including imported feed from Taiwan, Thailand and Indonesia. There are only 3 large shrimp feed mills in Malaysia. In **India**, CPF of Thailand cited local consumption and expansion of shrimp for its decision to build a third 80,000 tpy shrimp feed mill in the West coast, operational by early 2009. It has two mills in the East Coast with a total capacity of 170,000 tpy. It also imported 5,000 tons of feed in 2007 for the **Philippines** and expects sales to increase to 10,000 tones and will build a mill in Cebu in 2008.

Christopher Co

Impacts of 'fuel vs. feed', availability & rising raw materials prices

This riddle faced by producers was aptly summarized by Christopher Co, Overseas Feeds Co, based in Cebu, Philippines.

"Feed producers are in a crisis situation. Low farm gate prices, but feed prices are going in the opposite direction, due to increasing raw material costs, either directly, or indirectly. Directly, as prices of several raw materials have been increasing continuously and soybean in particular. Other ingredients are also affected, even though FOB prices are not fluctuating as much. This is worse when prices are CNF prices, when freight costs are included. Farmers have a hard time understanding when the forex began to change in the beginning of 2007. At the end of 2007, there was an appreciation of around 15% in the Peso versus the US dollar. They asked why feed prices are not lowered".

With crude oil breaching USD 100/barrel, it is the interest and demand for biofuels that has resulted in a huge impact on raw material costs for feed production. Corn has been sought after as a feedstock for bioethanol which has sent prices soaring. This has prompted farmers to use their land to grow corn instead of soy and wheat. Even prices of DDGS, by product of bio ethanol production and marketed as feedstock for aqua feeds has moved upwards from 8.5 THB/kg to THB11/kg. Interest in using DDGS is waning as feed producers have found inconsistent levels of pigmentation, reduction in the fat level of DDGS to accommodate its use in pig feeds and high levels mycotoxins.

The impact on aquaculture feed varies. It is ironical that the impact on shrimp feed seems to be less severe as formulations rely more on fishmeal where prices have receded from their highs. It only seemed like yesterday that researchers and the industry have been pushing for fishmeal replacement with vegetable proteins, notably soy. In Thailand, the price of soybean meal (SBM) has jumped from THB 10 to 11/kg early this year to a current THB 16.50/kg for Indian hi-pro SBM. Cassava pellets increased from THB3.7 in January 2006 to THB 5.8 today as cassava demand rose for bioethanol production in Thailand and China. For several years, corn was sold at THB 4.4 but in December 2007 it was THB 8.8/kg. (Note: Offshore exchange rate was THB 29.5 to USD1,9/1/2008).

Trends in feed production (tonnes) for marine shrimp and freshwater fish (calculated and estimated) in selected countries

	Marine shrimp feeds		
Country	2006[a]	2007	2008[e]
Thailand	860,000[cd]	884,000[b]	720,000[b]-790,000[c]
Indonesia	312,000	310,000[c]	356,000
Vietnam	290,000[cd]	320,000[c]	350,000[c]
India	135,000[cd]	190,000[c]	250,000[c]
Malaysia	80,000	100,000[c]	130,000[c]
Philippines	30,000	40,000[b]	48,000[b]
	Freshwater fish feeds		
Country	2006[a]	2007	2008[e]
Thailand	416,000	435,000[c]	640,000[b]
Indonesia	420,000	500,000[c]	550,000[c]
Vietnam	800,000[b]	1,069,200[b]	1200,000[b]

[a]estimates in 2006, Vol 3 (2); [b]calculated from shrimp production at FCR 1.7 and fish fed on commercial feeds FCR 1.6; [c]Industry estimates; [d]adjusted figures

Thomas Wilson of Thai Luxe Feeds, Thailand said, "We are now in a curious situation. SBM is a major feed component and prices have increased 45-50% in the last six months. At the time when it is getting more difficult to maintain margins, feed companies are going to have to substitute for SBM without changing feed performance. Making rapid changes is necessary but risky, and unfortunately, this situation favours large and well-equipped producers that have knowledgeable and competent formulators and nutritionists who know what to do".

Prices of wheat flour rose 70% from US235/tonne to USD400/tonne within a few months. Shrimp feed is still affected by wheat prices as flour and gluten are regularly used as fillers and binders respectively. In 2007, to produce cost effective shrimp feed for farmers facing low shrimp prices, all Thai producers started using Chinese wheat flour. This was cheaper by THB 6-8 than Thai wheat flour.

However, since December 2007, China removed the 13% export subsidy of its wheat flour for future contracts and implemented export tariffs (20-25%), bringing up the price of Chinese flour by almost THB 5/kg. In addition, China also announced a requirement for export quotas, effectively shutting the door on wheat flour exports. Even vitamin and amino acid prices which remained low over the past decade, have increased in 2007 and are expected to continue as Chinese environmental protection rules add costs to producers (Feed&Livestock, 2007).

Adding pressure on industry was the recent appreciation of Asian currencies. Even if production costs in local currencies remain stable, exporters will have to increase their prices in US dollar in order to maintain profits. The relatively higher value of the Thai Baht and Chinese Yuan will make Thailand and China less competitive than Indonesia if all other variables remain constant.

This may be a motivation to increase efficiency throughout the value chain. Industry is seeking information on enzymes to improve bioavailability of feed ingredients, P:E ratio to utilize more starch in feeds, reduce protein and take advantage of oil sources and alternatives to wheat flour and wheat gluten as binders.

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Celebrating twenty years in Thailand

Since 1985, commercial farming of the black tiger shrimp *Penaeus monodon* has proliferated in and around Samut Sakhon, Samut Songkhram and Phetchburi. This is when Thai Luxe Enterprise Public Co Ltd came about. The current President and Board Chairman, Mr Anurot Seneepakonkai, started a shrimp farm. Most of the feeds were imported from Taiwan and were expensive because of taxes and costs of transportation. There was a demand for lower cost locally produced feeds.

At 20th anniversary celebrations for Thai Luxe Enterprise. Mr. Anurot Seneepakonkai, Thai Luxe President (left), Deputy Prime Minister Kosit (center) and Mr. Rojphan press the button to mark the opening of the new fish feed factory, accompanied by two Taiwanese investors (far left) and the Provincial Governor of Phetchaburi.

"My father saw that local production of shrimp feed had a good business potential. He also had the advantage of close rapport with ingredient suppliers. By now, there were several shrimp feed mills in the area and at the same time, feed companies in Taiwan were looking for investment opportunities in the region", said Mr Rojphan Seneepakonkai.

"Two years later, in 1990, he entered into a joint venture with Luxe Group of Taiwan to set up a shrimp feed plant in 1990 in Samut Songkhram. The Taiwanese partner also provided technicians to help farmers in black tiger shrimp culture. In those early years, the industry standard in shrimp culture and feed processing was from Taiwan".

From then on, the company was on the growth trend, albeit with a minor hiccup during the Asian financial crisis in Asia in 1997. It was listed on the Thailand Stock Exchange in 1994. In the early days, small volumes of shrimp feed were exported to Malaysia and India, but today its customers are fish and shrimp farms in Thailand. In 2006, annual sales totaled THB2.2 billion (USD 63.6 million).

In November, Thai Luxe Enterprises (Public) Co., Ltd. Thailand celebrated its 20th anniversary in Phetchburi. It is dedicated to the production of aqua feeds. At the new fish feed factory, the management team comprising Rojphan Seneepakonkai, Director and Chief Operating Officer, Dr Thomas Wilson, Vice President and Chief Formulator and Dr Ajaya Bhaskar, Formulator, talked on significant developments in production and marketing of shrimp and fish feeds.

A winner in feed designs

In these last twenty years, what would you regard as your achievements?

Rojphan Seneepakonkai: It would be in 2001. We had remained relatively unknown in the shrimp feed market until then. In that year, we saw a niche market for lower protein feeds for the black tiger shrimp. I designed 'Lucky Feed' with 38% protein. This was a real departure as shrimp feeds in the market had 40-42% crude protein. The feed was well received as a 'value for price' alternative. We must have surprised the market as we did not have any competition for the segment until 2004 but by then we were already strong in this market.

I am happy to say that our 'Lucky feed' is still the leader in this product segment, although we now have 4-5 grades of feeds for the black tiger and vannamei shrimp. 'Lucky' still remains our flagship shrimp feed. Initially, it was an economical feed for the black tiger and later a premium feed for vannamei shrimp, when the species was introduced in Thailand.

We then went on to create a specific feed for the vannamei shrimp called 'Vanna' when its farming soared. This was because farmers were looking for a lower cost feed to match the production method. This was a feed with 33-35% crude protein which was subsequently further reduced to 32-33% protein. Every year, we try to design a new product to meet the demand of farmers. Newer designs may not be new products but optimized for the density of farming and customize according to requirements.

Outside the fish feed factory in Phetchaburi. From left. Thomas Wilson, Rojphan Seneepakonkai and Ajaya Bhaskar.

Ajaya Bhaskar: Even then, we knew that feeds for the monodon shrimp were already over formulated in terms of crude protein but in the absence of nutritional information based on amino acid requirements, producers tended to maintain these high levels of crude protein. In essence, what we did was develop a feed to match the needs of the shrimp without affecting growth performance. With this, we minimize wastage of protein and its impact on the environment.

Thomas Wilson: In fact, with the dominant culture of vannamei shrimp, one would expect interest in feeds formulated for this shrimp. However, some farmers start culture of vannamei shrimp with our premium grade 40-42% crude protein starter feeds for monodon shrimp and change to feeds for the vannamei shrimp as soon as they reach the first pellet grow out stage.

Since 2005, the Department of Fisheries has set standards for feeds for vannamei shrimp at 35% crude protein. However, specifications with 28 to 33% crude protein, approved before the new standards came into effect, are still used for several types of feeds such as for the mixed and supplementary shrimp feeds.

We have always believed that low cost feed is not necessarily the best value. In Suratthani, farms are successful with a stocking density of 80/m^2. There are a few farmers stocking up to 200/m^2 – 300/m^2 in 3m deep polyethylene-lined ponds with aeration. We feel that standard feeds are not suitable for high density rearing and that customised feeds with immune enhancements may be required to deal to the stressful conditions. We have been working on a product which is not only effective but which will give value to the farmer.

The company also has several firsts. Thai Luxe's shrimp feed factory in Petchaburi was the first in Thailand to obtain ISO 9002 certification for shrimp feed production. In 2003, it received ISO9001:2000 and UKAS certification. It was also the first in Thailand to be awarded the GMP and HACCP standard from the Department of Livestock Development, as well as the Q mark certification for food safety from the Department of Agriculture. Today, both factories have these standards.

On the same location in Phetchaburi, are the shrimp feed plant with four pellet lines and a fish feed plant with a production capacity of 70,000 tpy. A new extruder line of 2,000 tpm capacity will soon be added for the production of small feeds of 1.2 to 1.5 mm sizes.

Good years except 1997

Have the years been good for the company?

RS: Yes, they have been. The only significantly bad year was 1997 with the Asian financial crisis. Our small offshore loan became very large because of the exchange rate. What helped us was our record as a good customer with the bankers and we extended the debt to four years. In the end, we managed to repay the loan in two years. It helped that industry was performing well; shrimp prices were excellent at THB 600 baht/kg (USD 15/kg).

TW: This was also the year I was brought in to be responsible for fish feed production. I was attracted to the fact that the company was open to purchasing top quality equipment. In 1997, the company started plans to build a new shrimp feed factory in Petchaburi, and the old factory in Samutsongkhram needed to be profitable and sustainable with only the fish feed business. With the financial crisis causing a lot of stress among our customers, I changed the focus in fish feed from managing costs to managing quality as I believed the way to succeed was to minimize the risk that farmers would suffer losses, or would

question our feed quality or feed performance. This was a successful strategy, because sales increased from 5,000 tpy in 1997 – by an average of 20-25% year - to 60,000 tpy in 2006, and during the same time fish feed returns from customers dropped from 5% to less than 0.15%.

In 1999, production at the new shrimp feed factory in Phetchburi started and in 2000. The company also upgraded the existing fish feed production plant in Samut Songkhram. In 2002, it was permitted to export shrimp feed with the 'Thailand' trademark on its packaging. Business also expanded with a JV with Betagro for a shrimp feed production in Vietnam in 2003. In 2003, Thomas took over formulation of shrimp feeds, and using the same successful strategy and shifted the main focus of shrimp feeds to quality.

A new fish feed factory was constructed in 2004 and operations at this factory began in July 2005.

Innovative marketing

As a company dedicated only to fish and shrimp feeds and with several brands, did you depend totally on agents and distributors in marketing?

RS: We have an innovative marketing strategy. We created centres where the farmers could go to buy feeds. We now have a total of 11 centres nationwide. The oldest is in Songkhla where our first farmers came to buy feed. We use agents where sales centres are not convenient for customers. We can divide our feeds into three classes, from economy to premium. We only sell economy products through agents who require commission whereas premium products are sold directly.

Another important strategy is that we make it a point to take all our top managers on tours to all regions of Thailand. We visit agents and farmers. This is important and we aim to solve all their problems on site.

How is the custom made feeds part of the business?

TW: We develop custom formulations based on request only for large orders. Costing is based on standard cost plus the cost of the extra ingredients to be added. However, we do advise customers when there is no longer a need to add some particular ingredient in the feed. We use standard packaging (20 and 25kg) as well as 40 kg plain packaging to reduce packaging costs for customers who request it.

AB: Instead of adding products at the pond site, they come to us and we add these for them. Some require products to give shrimp more colour, for example. In this way, we can ensure homogenous mixing and we ensure only registered products are used. Farms, especially which are CoC (Code of Conduct) compliant have to be extra careful. As Thai Luxe has a small efficient business structure, we can do this. We have also worked on feeds using non GMO products such as corn gluten meal from Thailand, soybean from India etc in feeds.

Formulating and benchmarking

With the recent prices increases in plant meals and alternatives to marine meals, how do you manage to maintain costs?

TW: This is an unusual situation that we are in and this is affecting fish feeds rather than shrimp feeds. Many other plant products such as corn and soybean meal which used to be cost effective are now the reverse. We have several grades of fish feeds, the composition differing in the levels of fish meal, animal by-product meals and plant protein meals. What we have seen is that our cheaper feeds which use more soybean meal have become more expensive. It is not only this but also the inconsistent quality and colour such as in the case of DDGS. The critical issue is that changes in formulation must be done now. This cannot wait. However, I believe that we will survive as we have good nutritionists who can make immediate but nutritionally-sound changes in the feed.

Marine fish feeds. Keeping with industry trends, Thai Luxe has started to produce feeds for marine fish such the sea bass and grouper. Current markets are in eastern and southern Thailand.

We have tested 100% vegetable diets for vannamei shrimp and tilapia. We are nearly there and just need to do some fine tuning. These may not be cost effective but if the high price of soybean is temporary and fish meal prices increase, we will be ready. In the long term this is good for sustainability too.

How do you benchmark your feeds?

AB: We continuously benchmark our products with that of competitors. We have seen that our shrimp feeds though 5% cheaper than competitor products, show similar growth performances. We do not wish to say that we are number one in terms of quality. To do so means we become complacent and there will be no challenges ahead. We would like to be number two in terms of volumes and quality for fish feeds so that we can have something to look forward to.

Integration

Do you have any plans to be integrated?

TW: In the feed business, we want to help every farmer to develop his business. If the customer is successful and grows his business, we will grow as well. We believe that if we have a good value proposition, it will not be necessary to lock them in to keep them as clients. We are only partially integrated, which means we supply post larvae to shrimp farmers and fish fingerlings to fish farmers. We only go as far as sourcing good quality seedstock by developing strategic partnerships with existing successful hatcheries. They are experts in the hatchery business and using them is better than us making large but unsuccessful investments. In any case, if prices are good, price guarantees do not mean much, and most farmers will use premium feed.

RS: Yes, in future we are aiming to go into processing as well. We will use our processing plant which has been unused for eight years. Currently, we are discussing with several potential partners. We will be buying back fish from farmers but will not do contract farming. We are interested in a *Pangasius* species. We are not agreeable to lock in customers with feed and other inputs.

Final words

"We try to think that we are creative for our customers and it is this thinking that will allow us to move forward" – RS

"In terms of fish feed, we like to think of us as David vs. Goliath, as we have grown a lot and gained market share at the expense of our competitors. We need to give better products with better performance and better value. Quality is the key. Once customers come to us, they rarely go back to what they were using before." – TW

At 13th DSM Conference

Advances in nutrition, ingredients and processing

Five presentations looked at challenges facing the industry; formulation in fish and shrimp for the substitution of fish meal with sustainable sources of protein, new developments in the nutrition of the white shrimp, using by-products of biofuels for aqua feeds and nutritional genomics, the new approach to assess nutrient requirements in aquatic species and advances in extrusion technology.

Nutrigenomics explained

Dr Sadasivam J Kaushik

In his presentation, **Dr Sadasivam J Kaushik** of the Nutrition, Aquaculture and Genomic Unit of INRA, France enlightened participants on the science of nutritional genomics which is already 15 years old. In fish nutrition, biochemical and metabolic pathways are used to analyse the utilisation of dietary macro and micro nutrients and energy in feeds. This is used to evaluate the response of organisms to nutrients and to develop diets. At the farm level, growth and other observations are used to assess responses to diets. Now molecular tools are being used to get a better insight into how responses are mediated.

This presentation gave a molecular overview of the subject. This starts with an understanding of the functions of genes and other parts of the genome and then an understanding of organisms and their functions. In the cell, genes carry information for making the proteins required by the organism. A genome is all the DNA in the organism. In turn, these determine how the organism grows or lives, how the body metabolises food and fight infection or even how it behaves. The gene expression is at three levels, viz at the DNA level it not does change with time, next at RNA level and finally at the protein level, the last two change with time. Thus, the levels of proteins depend on how fast they are made or destroyed.

"In nutrition, feeds provide the 40 or so different nutrients. Dietary changes have multiple physiological responses and an integrated approach is required to analyse response at the gene level. How an individual gene or a given set or a network of genes act to individual nutrients and how interact with each other is nutritional genomics. This detailed information will help us to formulate more effective diets", said Sadasivam. He took the example of poor carbohydrate utilization by fish in which biochemical and molecular tools were used to study different enzymes involved in glucose utilization and endogenous production. In how fish oil replacement affects potential fatty acid bioconversion capacity, an analysis of expression of the genes in the liver of trout fed plant oils showed that 71 genes were expressed differently, of which 16 were up regulated and 55 down regulated. In the case of replacement of fish meal with plant protein sources, 75 genes were expressed of which 15 were up regulated and 60 down regulated.

Sadasivam concluded, "These molecular level tools will help to understand and validate biological data. It will show that nutrients have specific effects on genes. The future will see more metabolomic tools (NMR) being used for profiling ingredients"

Title: Nutritional genomics: A new approach to the nutrition and feeding of aquaculture species

From left. Vo Thi Kim Hang,Vietlong and Phan Dang Huu Thanh, Kien Thanh, Vietnam

Refining the nutrient requirements of the white shrimp

From left: Drs Denis Ricque Marie, Elizabeth Cruz-Suarez and Chalor Limsuwan

Dr Elizabeth Cruz Suarez, Universidad Autónoma de Nuevo León, Mexico discussed new developments in the nutrition of *Litopenaeus vannamei*. In 2006/2007, Latin America produced 800,000 tonnes of feeds for a production of 423,000 tonnes of shrimp. Industry practices are different from that in Thailand in that shrimp stocking density is low, generally 30-35 postlarvae /m^2 or less. Feed prices for the white shrimp range from USD 450 to 900/tonne, depending on protein content (range 22 to 45%) which in turn is dependent on the culture density. Lipids range from 7-12% and energy 3-5 kcal/g.

"Due to the growing interest in replacing fish meal with alternative proteins, there has been a continuous review on the requirements for amino acids, omega 3 fatty acids, phospholipids and cholesterol. These are critical for a substitution strategy. In commercial formulations, the requirements for some nutrients have been overestimated because of the lack of knowledge on the digestibility of ingredients and on the synergy between ingredients".

Digestible protein and energy

The protein requirements changes with species, size, energy, protein quality, amino acid balance and culture conditions and should be adjusted accordingly. Protein amounts depends on the amount per day, 10g per day of 50% crude protein diets equals 20g per day of 25% crude protein diet. It also changes with culture conditions, attractants and physical pellet quality. Protein is required for maintenance and after that for growth. Intake is somewhat regulated by energy of the diet: with a low energy diet animal should eat more, with high energy diets, shrimp eat less. Low energy diets lead to a low protein retention and increases nitrogen excretion.

"As protein is costly, we want to optimize protein deposition and minimize excretion".

For maximum growth, Kureshi et al., 2002, showed a requirement ranging from 20g/kg of shrimp/day of digestible protein for a 48% crude protein diet to 46.4g/kg of shrimp/day in a 32% crude protein diet. However, recently, Siccardi et al., 2006 found a requirement of 7 to 10 g/kg of shrimp/day of digestible protein for a 35% crude protein diet feeding 15 times per day. To produce maximum growth, a wide range with different feeding levels is possible. In Latin America, there is a tendency to use low density feeds of 25 to 35% protein due to contribution of natural productivity.

"For some Sonora shrimp farms, we use diets with 28-32% crude protein and 4-4.5 kcal/g. The weight gain averages 1.1g/week for a stocking density of 30-35 shrimp/m^2. FCR ranges from 1.8 to 2.2. The daily water exchange is 3-5%. There is no difference between 30-35% diets. The production cycle is usually 200 days with 2-3 partial harvest at 98-133 days, respectively and a 75-80% survival rate. Harvest size was 30g shrimp and yields are 5-6 tonnes/ha".

Over formulated in TSAA

The most critical adjustments are in the field of amino acid requirements for the white shrimp. These are mainly on the requirements for methionine, lysine and arginine. Methionine can be partially mitigated by cystine. Cystine accounts for about 40% of total sulphur amino acids requirement (TSAA). That is why it is better to consider TSAA rather than methionine only.

"Until now we have used the requirements suggested by Akiyama et al., for this shrimp. Now we have information that the TSAA in commercial feeds have been over formulated. Now lower amounts are recommended as the requirement is 28% lower than earlier suggested. Fox et al., 2006 reported that methionine can be as low as 1.26% of protein which is 0.4% of a 32% protein diet and TSAA, 2.62% of protein which is 0.84% of diet. This has an important economic impact as methionine is often the first limiting amino acid".

PL-cholesterol

Phospholipid (PL) and cholesterol supplementation is required for growth. PL levels are 1 to 7%. Research made by Gong et.al., 2000, has shown an interaction between dietary PL and cholesterol in *L. vannamei*. Dietary PL decreases cholesterol requirement. The requirement for cholesterol is 0.35% with no dietary PL, and 0.13% with 1.5 to 3.0% PL or 0.05% with 5% PL. Dietary PL reduces the dietary cholesterol requirement to get the maximum growth of vannamei shrimp.

Choline and PL

Elizabeth also highlighted some results of a study on choline and PL interactions (Gong et al., 2003). Dietary choline is required at 1,000mg/kg or highest growth with no dietary PL. However, when PL is added at 1.5 or 3%, no dietary choline was required.

"Thus, dietary PL could provide sufficient choline required for shrimp growth but not vice versa. Our work also showed that dietary phosphatidyl choline modifies the beta glucan binding protein, cholesterol and pro phenoloxidase plasmatic values in juveniles. The beneficial effects of inclusion of PL are when shrimp is under stress such as during low salinity, high temperature and low dissolved oxygen".

"In practical diets, shrimp, fish, crab meal as well as poultry by product meals provide PL and cholesterol. Pure cholesterol supplementation is not necessary. With soybean lecithin and some animal meals in the formula, the whole cholesterol requirement can be covered. However, special care is required when using plant meals".

Table 1. Formulation of practical diets with 35% protein and 8% lipid (Davis et al, 2006)

Test diets	9%FM	6%FM	3%FM	0%FM	Plant
Soybean Meal 47% CP	32.48	34.82	37.17	39.52	55.46
Milo	35.48	33.82	32.34	30.68	14.99
Poultry By-product	15.99	16.00	16.00	16.01	0.00
Menhaden Select	8.99	6.00	3.00	0.00	0.00
Corn Gluten	0.00	1.67	3.17	4.84	4.83
Fish Oil	3.96	4.22	4.47	4.72	5.76
Bentonite	1.00	1.00	1.00	1.00	1.00
Di-CaP	1.50	1.88	2.27	2.65	3.38
Vitamin Premix	0.33	0.33	0.33	0.33	0.33
Mold Inhibitor	0.15	0.15	0.15	0.15	0.15
Mineral Premix	0.08	0.08	0.08	0.08	0.07
Copper Sulfate	0.01	0.01	0.01	0.01	0.01
Stay-C 35%	0.02	0.02	0.02	0.02	0.02
Distillers corn grain					9.90
Squid meal, salt, KCl					3.00

Practical diets with no fish meal

Formulations of some practical diets were presented. Diets with 35% protein and 8% lipid have been prepared (Davis et al., 2006) using 100% plant meals. SBM contributed 55.46%, corn gluten at 4.83%, DDG at 9.90% and milo or sorghum at 14.99%. Feed was extruded, improving the digestibility of milo. Inclusion of dicalcium phosphate was increased (table 1). From the proximate composition, it was shown that the formulation used a lower level of requirement for TSAA of 1.1% instead of the previous 1.3% for this level of protein.

In 17 weeks and zero exchange water, FCR ranged from 1.12-1.38. Yields were approximately 6 tonnes of 20g shrimp. However, it was emphasized, "As this feed was produced by extrusion, we will need to see whether can get the same results with pelleted feeds. We also need to look at culture systems. The corn gluten is used as a source of methionine, fish oil is increased to compensate for the lipid content as soybean meal is low in lipid. Squid liver is added to stimulate feeding".

In another formulation in Ecuador for 30% crude protein and 10% lipid feed, rice byproducts and wheat are used as digestible energy source. Feather meal is added as a source of cystine. Kelp meal is used as a binder and to improve texture of pellets. The hydrocolloids in the seaweed also absorb water change the texture and shrimp will eat more.

In her conclusion, Elizabeth predicted,

"In the following year, my prediction is that shrimp formulas will change. However fish meal will continue to be used if available, because it is a good ingredient. We will continue to use soybean meal products, at almost 60% and renderers products. I see soy protein isolates, canola protein and pea protein concentrate, substituting for fish meal. Pretreated milo or sorghum will improve its digestibility to the same value as wheat. Pea meal is a good source of starch; we have shown that we can add this replacing wheat/soybean mix with good results. There will also be an increase in the use of soybean lecithin and marine seaweed as binder and attractant. Use of special amino acids, already available in the market will increase only if their effectiveness is proven. Perhaps we will also see more use of corn gluten to compensate for methionine deficiency and some DDGS. The only worry is mycotoxin contamination".

Title: New developments in the nutrition of L. vannamei in Latin America by L. Elizabeth Cruz-Suarez and Denis Ricque Marie.
(Note: Further details are available from the proceedings of the symposium on aquaculture nutrition held every two year in Mexico and available at http://w3.dsi.uanl.mx/publicaciones/maricultura/

DDGS and by products of biofuel production in aqua feeds

Professor Ronald W Hardy, Aquaculture Research Institute, University of Idaho, USA said the twin demand for biofuels and food is altering the landscape for global commodities and feed ingredients. It is presenting challenges in the feed ingredient market with supply, prices and opportunities on how to use the protein by-product from biofuel production in feeds. In the US, for each 2.56 kg of corn, one litre of ethanol (EtOH) is produced. In 2007, in the US alone demand was 6 billion. As mandated by the US congress, this will rise to 33 billion by 2020. Brazil is also a major producer of bioethanol from corn. This demand has fueled increases in corn prices from USD 78.50/tonne to USD 142.60/tonne with a disruptive effect on the feed industry. In the US, the planting of more corn also meant a changing in cropping patterns with a decrease in wheat and soybean planting. Prices for soybean meal rose from USD 210.96/tonne to USD USD 288.31/tonne within a year. That for wheat flour rose from USD 110/tonne to USD321/tonne. High prices will continue towards 2008. How can aquafeed producers deal with these changes?

The by-products from ethanol production (EtOH) depend on the process used. Protein by products from the dry process, which is most common are Distiller's Dried Grains (DDG), Distiller's Dried Grains with Soluble (DDGS). The wet process will produce DDG, corn gluten meal, and corn gluten. As considerable research is ongoing to approach the issue of replacing fishmeal in aqua feeds, DDGS is considered as an alternative. Before the price increase in DDGS, it cost USD 0.446/kg of protein for 28-35% crude protein DDGS (USD 125/tonne) as compared to USD 1.46/kg protein for 72% anchovy fishmeal priced at USD 1100/tonne. It is rarely used for aqua feeds but the potential is in feeds for catfish, tilapia, carps and other omnivores.

The general composition of DDGS is 10% lipid, 27% crude protein, 7% fibre, 4% ash and 43% NFE (non digestible carbohydrate). Lipid quality is similar to corn oil with the same fatty acid profile. This can change with new strains of corn with higher levels of fermentable carbohydrates and with the process which can reduce fibre by air classification, thus increasing the percent of protein. The product Dakota Gold has a higher protein (in terms of quantity not quality), achieved by removing some NFE.

"However, the possibilities for increasing protein levels are high with new bio-refining techniques. A mechanical or enzymatic process can separate the high starch endosperm in corn and only the endosperm is fermented. Here the protein level can be increased to 44% and fat reduced to 3%. Further refinement with enzymatic pre treatment of corn can produce up to 66% crude protein DDGS", said Ron.

Studies on DDGS in aqua feeds have been done for the trout, catfish, marine fish and shrimp, *Macrobrachium* prawn and tilapia. Juvenile catfish fed 35% DDGS with soybean meal showed the same growth and FCR as fish meal diets. Also in catfish, diets with 70% DDGS showed growth equal to diets with no DDGS and 10% fish meal but only when supplemented with lysine. When DDGS replaced fish meal at 40% of the diet for *Macrobrachium* prawn in ponds, there was no change in growth performance. The changes are in the omega-3 fatty acid composition of the tissue. Despite these studies, usage of DDGS in aqua feeds remains low. In marine fish, the high level of indigestible carbohydrate restricts it to supply only 18% of protein. In tilapia, growth was lower with DDGS and 30% inclusion is possible with additions of soybean meal and meat and bone meal.

From left, Barbara Allen, USA, Professor Ronald Hardy and Martin Guerin, Gold Coin Specialties, India

Ron said that in the future, we will see a new generation of by products from biofuel production from 2008 to 2010, as these are a source of revenue equal to ethanol. These include

- food grade soybean concentrate using new extraction methods (i.e. not using iso hexane extraction), with a minimum protein of 65% protein and more than 90% digestibility for fish and eventually low phytase and low linoleic acid soybeans
- soy-corn protein concentrate as EtOH by products with 50-55% crude protein with more than 85% digestibility.
- barley and wheat concentrates with 70% crude protein and more than 90% digestibility.

However, the challenges will remain on how to have the right mineral and amino acid balance and overcome antinutritional factors in oil seeds such as glucosinolates, phytate and phytoestrogens and increased faecal outputs because of high fibre.

Title: Distiller's dried gains with soluble (DDGS): Potential as an ingredient in aquafeeds and impacts of ethanol production on prices and availability of grain and oilseed products.

Alternatives for fishmeal for cost efficient feeds for carnivorous marine fish species

The need to replace fish meal and fish oil has led to the use of plant material such as protein concentrates from corn, soybean, peas, wheat, barley, canola and by-products of biofuel production said **Styliani Adamidou** from Hellenic Centre for Marine Research in Greece. Each of these materials may be deficient in essential amino acids but they can be combined with each other or supplemented with synthetic amino acids. The anti nutritional factors can be reduced with specific treatments. Feed now account for about 50% of the cost of production. Production value for the salmon (Euro 2.95/kg), European seabass (Euro 5.21/kg), Asian seabass, (USD 2.3/kg in Asia), barramundi (USD 6.30/kg in Australia) and flatfish (average Euro 1.24/kg). Alternatives to fishmeal help in the production of more cost efficient feeds.

Some animal meals (such as meat and bone meal, poultry meal and blood meal) have low deficiencies in amino acids. Levels of histamine, isoleucine, lysine and tryptophan are slightly lower in meat meal. Styliani Adamidou presented published research on the digestibility (ADC) of protein in meat meals. Poultry offal meal protein digested 78.8% from Asian sea bass. Blood meal preserved with proprionic acid had higher protein ADC for humpback grouper, compared to dry blood meal. The replacement of fishmeal with meat/blood meal (4:1) is limited to 20% for grouper in terms of growth. However, animal by products are still banned in Europe and even if the ban is removed, it will not be accepted by consumers, still wary of mad cow cases in the late 1990s and early 2000s.

Cereals are mostly deficient in lysine, while legumes in methionine and cystine. The ADC of protein was high with wheat gluten and lupin kernel meal in Asian seabass. This declined to 67% with full fat soybean meal in the humpback grouper. In Asian seabass, the ADC of protein was highest in ipil ipil leaf (78%) and lowest with rice bran at 68.5%. In cobia, for optimal growth the substitution of fishmeal with soybean meal is limited to a replacement level of 40% only. In the same fish, yeast based protein can replace fishmeal at a 75:25 ratio (fish meal: yeast).

On carbohydrates in feeds for marine fish, she said, "There is no proof that they need this but certain treatment and inclusion levels show beneficial effects. Digestible starch should not exceed 20% in diets for carnivorous fish".

Starch, usually from wheat is a cheap source of energy and also acts as a binder, in particular gelatinized starch. As corn and wheat prices are increasing, their use may be limited by cost. Sea bream fed extruded corn or wheat starch showed better results than the raw starch of these materials. The maximum inclusion in diets for marine fish was given as 20%. In the replacement of fish oil with plant oil, she said replacing with palm and other oils could affect the organoleptic properties of flesh. Linseed oil gives a milky odour and lower fat texture in turbot. However, a wash out period with fish oil diets can restore flesh quality and the fatty acid composition with high omega 3 fatty acids, as preferred by consumers.

She concluded that, "For sustainability, replacing fish meal and fish oil is the only way for cost efficient diets. There is a potential to replace a significant part of fishmeal with non-marine sources, but do we need to replace 100%. To do so, pretreatment of many ingredients will be required".

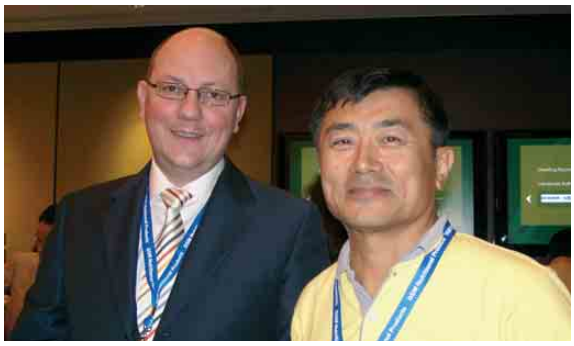
Title: Sustainable and cost efficient feeds for marine fish species.

Advanced extrusion technology for changing raw materials

The above authors discussed the use of new raw materials in aquafeeds and on issues concerning the replacement of fish meal with animal and plant meals. Feed manufacturers face the challenge of how to use the changing availability, quality and price of raw material in feed formulations and remain competitive. There are also the challenges of the growing variety of farmed species. **Thomas Landert**, Buhler, Switzerland, said in his presentation on online control of cooking degree and product density that these changes pose pressure on providers of processing solutions.

He said, "Fast changing product developments and formulations run increasingly contrary to process optimization while economics ask for efficient processing and therefore minimized energy application. In a feed plant, raw materials account for approx. 80 - 90% of production costs and therefore already minute optimizations in raw material formulations and their processing will lead to substantial cost reductions. Optimized product characteristics improve FCR and reduce overall production costs at the farmer level".

Modern, sophisticated process technology with the latest automation tools allows now for separate optimization of the cooking degree and product density. It also allows for simultaneous online adjustments which eases the work of both nutritionist and operator significantly. Thus, process conditions can be optimized while product properties are maintained at constant or even improved levels.



Thomas Landert (left) with Dr Ming-Dang Chen, CPF, Thailand

Thomas outlined the steps in extrusion processing, such as pre-conditioning, cooking and forming. He explained how easily the SME control module in the cooking zone can keep a consistent degree of cook even when ambient conditions or raw material compositions, i.e. oil content, change. Efficient control of product density at the forming zone is important to match floating/sinking characteristics of feeds with the requirements of species, environmental conditions, raw material and formulation and post processing of feeds, such as drying or vacuum fat coating.

Title: Online control of cooking degree and product density by new extrusion technology

Improving shrimp performance and better profit margins in India and Bangladesh

By Chris King, Mohammad Mamun and Dhanunjaya Goud

Farm trials in India and Bangladesh have shown that the application of a unique sustainable proprietary ingredient with functional nutrients can result in better growth, lower feed conversion ratios, increased survival rates and biomass production as well as improved shrimp condition. These factors all contributed to a lower production cost and a higher output.

Ponds in Bangladesh used for the trials

Farm staff with final harvest

Shrimp production

In the 2006-2007season, marine shrimp production in India increased marginally to more than 150,000 tonnes, mainly with the black tiger shrimp *Penaeus monodon*. Research and development programs are working in various sectors such as broodstock development and pathogen free shrimp seed production. Processing and the development of value added products are areas for expanding export markets.

In Bangladesh, farmed shrimp production reached 90,000 tonnes in the 2006-2007 season. It was mainly black tiger shrimp. Farmers in Bangladesh continue to face many obstacles including disease outbreaks and reliance on wild caught fry due to limited seed production facilities. The industry has an important role in the economy of the country as shrimp is the second largest export after textiles and it provides vital jobs.

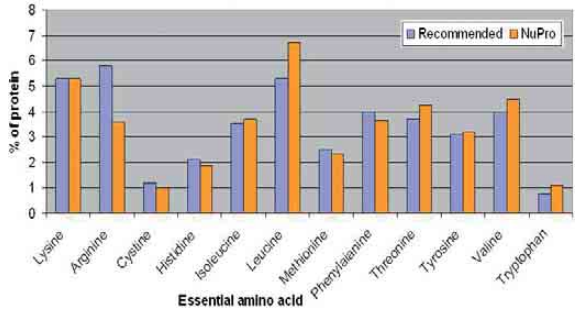
The current boom in shrimp production from China and South East Asia coupled with the depreciation of the dollar with respect to the Indian Rupee has driven down prices making the market place very competitive. Methods for maximising productivity and efficiency are therefore vital to ensure competitiveness within this industry. This article considers the effect of a proprietary feed ingredient on the growth and performance characteristics of the black tiger shrimp in India and Bangladesh.

Functional feed ingredient

Shrimp like other fish and animals have a requirement for a well balanced mixture of essential and non-essential amino acids for growth and tissue building. The proprietary ingredient (NuPro®, Alltech Inc., USA,) is a source of highly available amino acids and provides the balance of essential amino acids required in shrimp diets (Figure 1, Fegan, 2006). Derived from a specific yeast strain the production and refinement process makes it a highly digestible ingredient with a crude protein content of approximately 50%.

In addition to the protein content and digestibility, there are also

Figure 1. A comparison of typical essential amino acids (EAA) requirements for shrimp and the EAA profile of NuPro. (Fegan, 2006).



significant benefits as a functional nutrient. It is a rich source of nucleotides, estimated to be around 7% of the dry weight, which are highly soluble making them easier to assimilate than nucleotides bound in insoluble forms, such as nucleoproteins. Nucleotides are known to play a major role in almost all biological processes and this includes: storage of energy, components of several coenzymes which are involved in carbohydrate, protein and fat metabolism, mediation in cellular processes, control of several enzymatic reactions and intermediates in biosynthetic reactions.

In addition, vitamins such as inositol and other inherent components are known to be potent feeding stimulants and attractants. There are also significant amounts of glutamic acid and active nucleotides, including 5'-IMP and 5'-GMP, which are known to enhance flavour.

These beneficial attributes are advantageous to a slow feeder such as the marine shrimp, where increased attractability and palatability leads to earlier location and ingestion of food particles. NuPro can replace fish meal in diets for the Pacific white shrimp *Litopenaeus vannamei*) in the USA (Craig and McLean, 2007, Mclean et al, 2006). Work with varying inclusion rates in fish species such as carp (Staykov et al, 2007), trout (Staykov et al, 2006) and cobia (Craig and McLean, 2005) have also highlighted the versatility and functional advantages of this unique ingredient.

Field trials

Field trials were conducted at several farms in India and Bangladesh during the 2007 growing season and the results of two trials with black tiger shrimp are presented here. The first trial took place at the farm of Mr Venu Raju in the East Godavary District of Andra Pradesh in India. Here shrimp were stocked in grow out ponds at a stocking density of 12-15 animals/m^2 and fed either a standard commercial shrimp feed, or the same one with NuPro® top coated at 20g/kg of feed. Feeding was once a day at the night feeding.

De-Odorase®, a natural yucca extract, was also added at the rate of 500g/acre (830g/ha) in order to maintain water quality parameters in both the treatment and control ponds. The shrimp were fed these diets for a period of approximately 104 days prior to harvest.

The second trial took place at the farm of Sheikh Mostafizur Rahman, Shahera Farm in Bangladesh. Here, juvenile shrimp, of 3g average weight, were stocked in grow out ponds at a stocking density of 4 shrimp/m^2 and fed either a standard commercial shrimp feed, or the same feeds top coated at 30g/kg of feed. Feeding was for 45 days prior to harvest.

Figure 2. Average body weight of the shrimp obtained in the two trials.

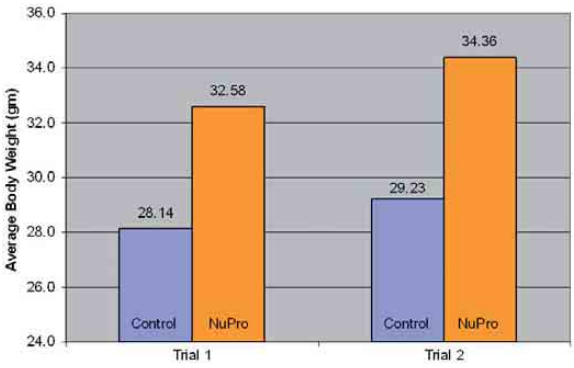
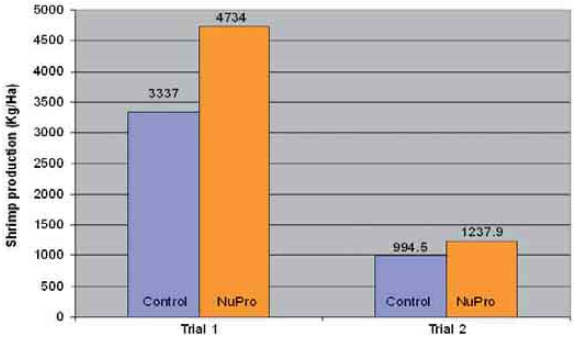


Figure 3. Total yields (kg/ha) in the two trials.



Growth performance

In both trials, growth of shrimp fed top coated diets improved in comparison with those in control ponds. The average body weights and total yields were significantly higher (Figure 2 and 3). In all ponds, shrimp fed top coated diets were larger and had less individual size

Figure 4. Comparison of survival rates in the two trial ponds.

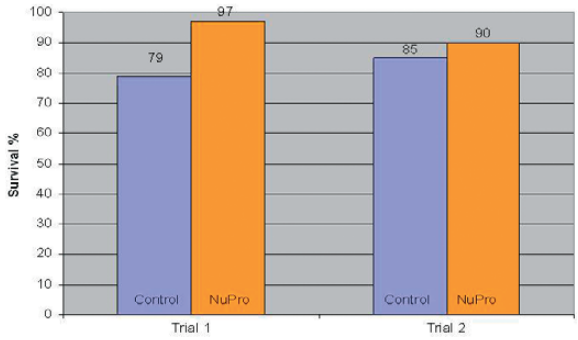
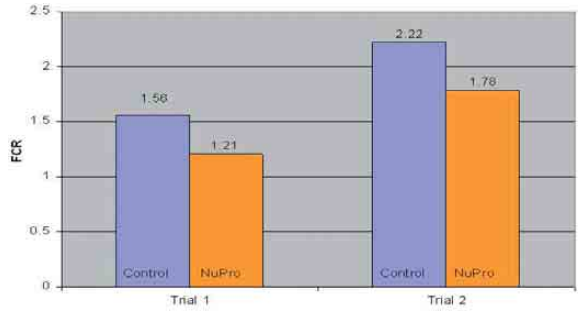


Figure 5. Comparison of feed conversion ratios (FCR) in the two trial ponds.



variability when compared with shrimp from the control ponds.

In addition, survival rates were higher (Figure 4). Survival in the treated ponds was 97% in the first trial and 90% in the second trial as compared to the control ponds with 79% and 85% survival, respectively. Feed conversions ratios (FCR) were better (Figure 5). In the first trial, FCR was 1.21 in treatment ponds as compared to 1.50 in control ponds. In the second trial, FCR was 1.78 in treatment compared to 2.22 in control ponds. These improvements in FCR represent considerable economic benefits given that feed can represent approximately 50% of the production cost of shrimp. The specific effect of this proprietary ingredient as an attractant and palatability enhancer was not studied in these trials but it was felt that it was this characteristic that was an important factor in improving FCR..

Shrimp appearance

Farmers said that shrimp pigmentation was excellent. Shrimp also had a brighter, clearer appearance and a lower incidence of conditions such as tail rot. In the first trial symptoms of soft or loose shell were not observed in the treatment ponds but was evident in the control ponds. In the second trial, a lower percentage of soft shell at 5% was observed in the treatment ponds compared to 12% soft shell in the control ponds.

Summary

In these trials, farmers in India and Bangladesh have demonstrated that the practical application of NuPro by top coating commercial shrimp feed on the farm at between 2% and 3% of feed fed (20-30 g/kg) resulted in shrimp with better growth, higher biomass/ha, and better FCRs when compared to shrimp in control ponds. The shrimp had less incidences of loose shell and were a better and brighter in appearance.

It was postulated that improvements in FCRs may be due in part to the improved attractability and palatability of the top coated feed. Farmers have observed that the shrimp consumed this feed faster than the standard feed in control ponds. This improvement in feeding therefore limits the leaching of the soluble components from the feed. Feed consumed by the shrimp would have a higher nutrient value thus contributing to the improved feed conversion ratio.

Details of the cost of production were available for the first trial and these indicated that the improved shrimp condition and higher average body weight resulted in a 20.5% higher price/kg of shrimp and a 22.8% lower production cost in the treatment ponds when compared to those in control ponds. This resulted in a three-fold higher net profit per hectare in the treated ponds for the farmer.

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Insect peptide protein can partially replace fishmeal in feeds for white shrimp

By Wang Guang-Jun, Zhong Ming, Xie Jun, Yu De-Guang, Yin Guang-Ping

This 56-day evaluation on partial replacement of fish meal in outdoor ponds in Guangzhou, China showed that insect peptide protein in diets for the vannamei shrimp had good growth performance. No differences were shown in FCR and survival rates.

Insect peptide protein is a polypeptide, produced on hydrolysis of the housefly larvae using a unique method. It is easily digested and absorbed by aquatic animals. Its main characteristics are that it contains an abundance of amino acids and fatty acids, essential for growth of aquatic animals. It also contains antimicrobial peptides and proteins which can assist with immunity, disease resistance and anti-stress capabilities of aquatic animal. It is also a very good attractant.

In China, *Litopenaeus vannamei*, also called white-leg shrimp, together with *Penaeus monodon* and *Fenneropenaeus chinensis*, are three marine shrimp species. It has the advantage of rapid growth, strong ability to with stand stress, delicious flesh and suitable for intensive aquaculture. Since its culture in southern China in 1998, *L. vannamei* has become the major species of shrimp culture in coastal areas (Wang, 2000).

In this trial, we studied the effect of partial replacement for fish meal with insect peptide protein on the growth performance and apparent digestibility of this shrimp. The aim was to propose the application of insect peptide protein in shrimp diets.

The trials were carried out in 2m x 2m x 0.8m net cages placed in outdoor concrete ponds. Each cage was stocked with 60 shrimp.

Experimental procedures

Shrimp: Shrimp were taken from a farm in Panyu district of Guangzhou and were reared in the pond for one week. Healthy individuals were selected for the trial. The average body length was 5.31 ± 0.33 cm, the average body weight was 1.46 ± 0.78g. The trial began on September 1, 2006, and ended on October 27, 2006.

Culture system and water quality: The trials were carried out in 2m x 2m x 0.8m net cages placed in outdoor concrete ponds. Each cage was stocked with 60 shrimp. Throughout the trial period, the effective water depth was 0.8 m. Pond water was filtered with sand filtration and salt was added to increase salinity to 1-2 ppt. Aeration was continuous. The dissolved oxygen was 4.0 mg/l in morning and 6.0 mg/l in the afternoon. Water temperature was 21.5 - 30.0°C. Water was exchanged at 30-40% of volume per week. Water was sampled regularly for ammonia and nitrite concentrations. Water temperature, pH, and dissolve oxygen were recorded twice daily at 09:00 and 15:00.

T able 1. Composition of diets (% dry diet).

Treatments	1	2	3	4
Ingredients				
White fish meal	36.0	24	12	0
Insect peptide protein	0	12	24	36
Fermented soybean meal	20.0	20.0	20.0	20.0
Squid paste	3.0	3.0	3.0	3.0
Shell powder	18.0	18.0	18.0	18.0
Starch	8.0	8.0	8.0	8.0
Peanut cake	11.0	11.0	11.0	11.0
Fish oil	1.0	1.0	1.0	1.0
Calcium dihydrogen phosphate, $Ca(H_2PO4)_2$	0.5	0.5	0.5	0.5
Vitamin Mix	1.5	1.5	1.5	1.5
Mineral Mix	1.0	1.0	1.0	1.0
Total	100	100	100	100
Proximate Analysis (dry basis)				
Moisture (%)	5.77	5.84	5.29	5.80
Crude protein (%)	45.14	43.77	44.26	43.31
Total lipid (%)	3.38	2.77	3.20	2.23
Ash (%)	18.26	18.25	18.42	18.05
Total phosphorus	1.69	1.63	1.63	1.63
Calcium	3.38	3.18	2.84	2.55

Diets: The insect peptide protein was provided by Guangzhou Xintai Biological Protein Peptide Co.,Ltd. It was used to replace fish meals in the following proportions: Diet 1 (36% fishmeal+0 insect peptide protein), diet 2 (24% fishmeal +12% insect peptide protein), diet 3 (12% fishmeal +24% insect peptide protein) and diet 4 (0 fishmeal +36% insect peptide protein). All feed ingredients were ground into 60 mesh size particles and mixed. These were extruded into 1.2 mm diameter feed using a twin-screw extruder. After drying, feed was kept in the refrigerator until use. There were three replicates for each diet. Diet composition and proximate analysis are given in Table 1. Shrimp were fed 3 times daily at 4-6% body weight at 08:00h, 12:00 and 17:00 to apparent satiation.

Growth parameters: Data recorded were weight gain, survival rate and FCR. All of the data were analyzed and processed with SPSS11.0 statistical software. Significant differences between groups were tested using analysis of variance (ANOVA) at $P < 0.05$.

Apparent digestibility: For the determination of apparent digestibility of dry matter and protein, 1% Cr_2O_3 was added in basal diet as the inert indicator. After the culture trial, healthy individuals were selected and restocked into 400 litre plastic barrels. Each barrel contained 15 shrimp. Water exchange was 0.25 to 0.33% of its volume per day.

Shrimp were acclimated to the basal diet for three days. Faecal collection started on day 4. Shrimp were fed twice daily at 08:00 and 16:00. After 30 minutes of feeding, leftover feed was removed. Faecal collection followed every 2 hours using a siphon. After drying in the thermostatic drying chamber at 80°C, the protein content of feed and faeces were determined by Kjeldahl digestion (GB6432-86).The Cr_2O_3 content was determined with a quantitative method. First the samples

were heated with nitric acid and oxidized with perchloric acid. A colorimetric determination at 350 nm with a 721 spectrophotometer followed.

The apparent digestibility of dry matter protein was calculated as ADC=(1-C_1/C_2)x100 and ADC=(1-C_1N_2/C_2N_1)x100, respectively where C_1 is the Cr_2O_3 content in feed; C_2, the Cr_2O_3 content in feces; N_1 is the crude protein content in feed and N_2 the crude protein content in faeces.

For the apparent digestibility of insect peptide protein, the test diet comprised 70% basal diet and 30% insect peptide protein. Chromic oxide at 1% was added in test diet as exogenous indicator. The apparent digestibility of insect peptide protein was calculated as the apparent digestibility of test feed- the apparent digestibility of basal diet feedx0.7)/0.3.

Growth, FCR and ADC

Table 2 showed that the body weight gain of shrimp fed diets 3 and 4 were significantly higher ($P< 0.05$) than shrimp fed diets 1 and 2. There was no significant difference in weight gain for diets 1 and 2. Thus this showed that replacing fishmeal with insect peptide protein can accelerate growth of the shrimp. However, there were no differences in survival rates and feed conversion ratio (FCR) between diets.

Table 2. Results of trial

Group	Final body weight	Initial body weight	Body weight gain (%)	Survival rate (%)	FCR
1	1.57±0.08	5.45±0.18	247.13±5.47[a]	96.11±2.55	1.26±0.25
2	1.46±0.07	5.37±0.19	267.81±8.92[a]	97.22±1.92	1.22±0.31
3	1.39±0.09	5.44±0.17	291.37±11.31[b]	96.67±1.67	1.27±0.19
4	1.42±0.08	5.71±0.22	303.07±10.95[b]	96.67±3.33	1.23±0.34

Different letters in the same line indicate significance at $P<0.05$.

Table 3 showed apparent dry matter digestibility of insect peptide protein in shrimp was 69.42%, and that for protein was 69.03%.

Table 3. Apparent digestibility coefficients (ADC)

	ADC of dry matter (%)	ADC of protein (%)
Basal diet	44.22±2.65	68.56±2.65
Experimental diet	51.78±4.74	68.70±4.74
insect peptide protein	69.42±3.10	69.03±3.10

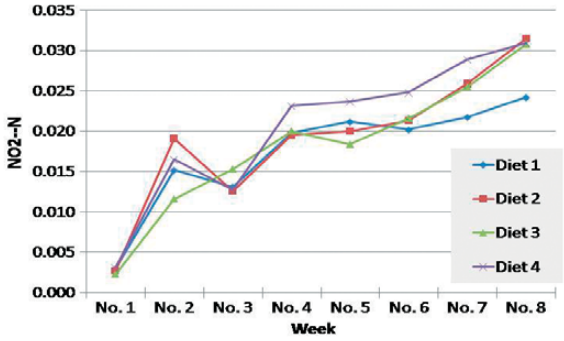
Water quality

Figure 1 showed that during the experimental period, the nitrite concentration ranged from 0.002-0.03 mg / l. During the culture period, nitrite concentration increased. However, there was no significant difference between the test groups and the control systems. During the experimental period, ammonia nitrogen ranged from 0.02 to 0.04 mg/l. As culture continued ammonia nitrogen concentration increased in all systems.

The feasibility of using insect peptide

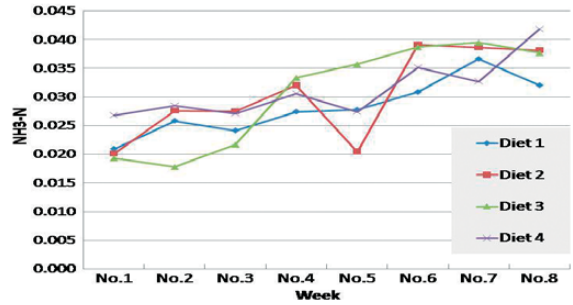
In feeds for shrimp in intensive culture systems, fishmeal has always occupied 30% of total feed cost. However, issues in the supply and demand of fish meal are becoming increasingly prominent. In finding replacements for fish meal in aquatic feeds, the aim is to find a cheaper alternative source of animal and plant protein thereby reducing production costs.

Figure 1 Changes in nitrite concentration.



Harvested shrimp

Figure 2 Changes in ammonia nitrogen concentration



Generally, the protein, mineral and vitamin composition of animal protein sources are higher. Although there are abundant sources of plant proteins and these are easily processed, generally its nutritional value is lower than animal proteins (Li,1996). In these culture trials, growth performances of shrimp were not restricted when fed insect peptide protein, replacing fish meal in the diet. Results showed that this ingredient can entirely replace high-grade fish meal in shrimp diet.

Digestibility data presented here reflected the percentage of feed utilised by the animal. The apparent digestibility of materials indicates its digestion by aquatic animal (Li,1996). Chang Qing et al showed that the apparent digestibility of *Lateolabrax japonicus* for dry matter of fishmeal and bone meal was 62.03% and 58.62%, respectively (Chang,2005). Jiang Ming et al (2006) showed that the apparent digestibility of *Ctenopharyngodon idellus* for dry matter of bone meal and imported fishmeal was 60.69% and 59.07%. Yu Yu showed that apparent digestibility of dry matter in *L. vannamei* of imported fish meal and chicken powder was 64.3% and 63.2%, respectively (Yu, 2006). In this trial, apparent digestibility of insect peptide protein indicated that insect peptide protein is a suitable animal protein source for shrimp.

Acknowledgements

The authors are grateful to Miss Wu Lan and Hu Zhao-ying for culturing the shrimp, and Mr, Lan Han-bing for diet preparation.

References are available on request.

Wang Guang-Jun in front of the cement tanks used for the trials.

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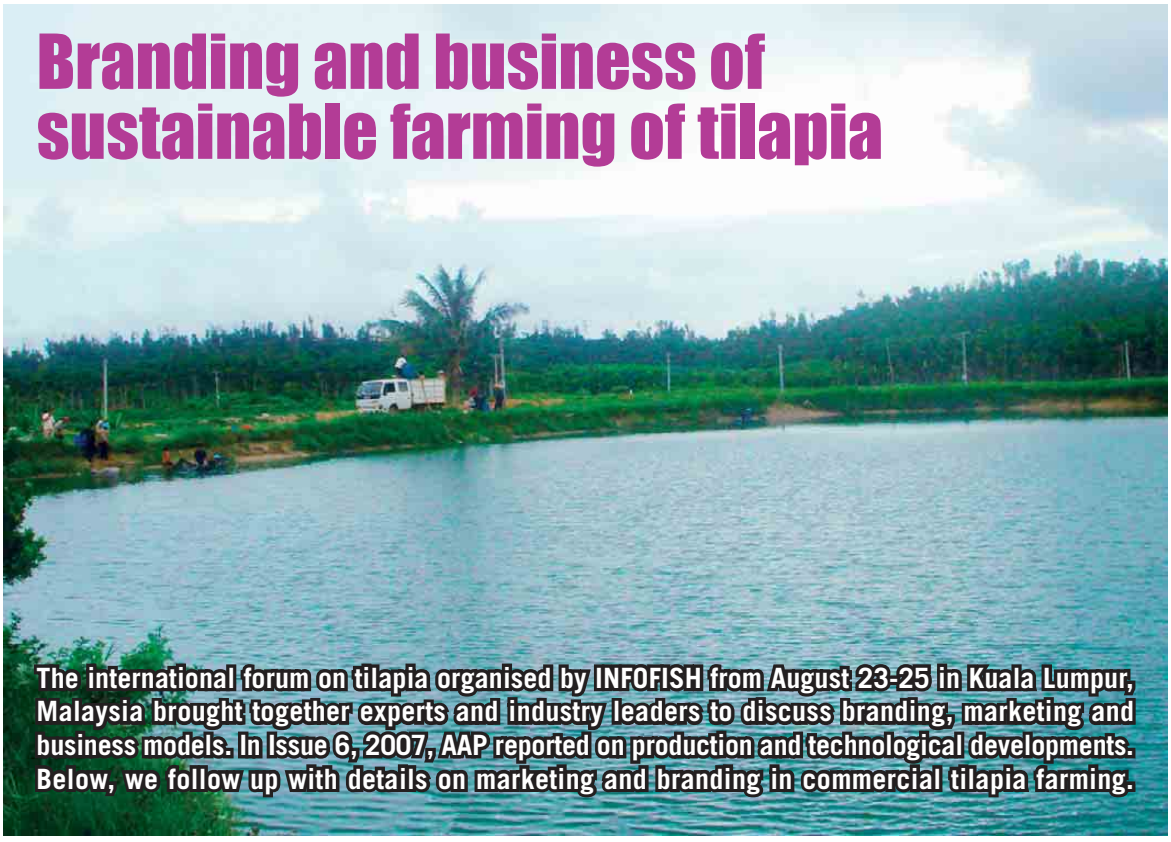
Branding and business of sustainable farming of tilapia



The international forum on tilapia organised by INFOFISH from August 23-25 in Kuala Lumpur, Malaysia brought together experts and industry leaders to discuss branding, marketing and business models. In Issue 6, 2007, AAP reported on production and technological developments. Below, we follow up with details on marketing and branding in commercial tilapia farming.

Tilapia ponds in Hainan

A growing international trade

World trade in tilapia has double in three years to 200,000 tonnes according to **Helga Josupeit**, FAO. The flow of trade showed that tilapia in Africa goes to European markets. Ecuador sells chilled fish to the US. The US remains a major market for most Asian producers for whole and frozen fillet whilst China targets EU markets and with more value added products. Exports from China in 2006, comprised of 98,862 tonnes of preserved tilapia, 46,901 tonnes of frozen whole and 35,038 tonnes frozen fillet and are mainly to the US, according to **Chen Shuping**, INFOYU. Despite a new trend on value adding, prices have remained stable. It is USD 2.7/kg for frozen fillet and USD 1.1/kg for whole frozen fish. The new trend is in the export of 'preserved tilapia at USD 2.7/kg.

In the US markets, **Martin Sukkel**, Regal Springs Tilapia said that the frozen fillet has overtaken whole frozen fish since 2005. These came from China and Indonesia. Per capita consumption rose to 0.97 lbs in 2006. 'Real fresh' (as opposed to CO treated fillet) are from Costa Rica, Honduras, Ecuador and Colombia. In their presentation on markets in Europe, **Erik Hempel**, INFOSA and **Sudari Pawiro**, INFOFISH said that tilapia is still a new product in Europe. It imported 19,965 tonnes of tilapia in 2006.. These were mainly from Thailand, China and Africa. Imports from Africa are from Zimbabwe, mainly in the form of fresh and frozen fillets.

Prices in the EU markets have dropped in recent years. Frozen fillet prices were USD 3.63/kg in 2004 and USD 2.57/kg in 2006. In EU markets, the tilapia faces strong competition from several whitefish species including the *Pangasius* catfish from Vietnam. Local production of tilapia is forecasted to increase but these will be fresh fish to the restaurant market at relatively high prices. They concluded that imports will increase despite the EU's stringent requirement on hygiene and food safety.

In the Middle East, **Izzat Feidi**, Consultant said that the general preference is for fresh whole (round) fish and with supermarkets spreading in main cities, chilled and frozen fish products are now widely accepted. In 2005, Kuwait, Qatar, Saudi Arabia and UAE imported 3,620 tonnes. Most of these come from China. On future demand, he added that based on a consumption pattern of 11.5 kg/annum of fish, an additional 500,000 tonnes in fish supply is required by 2015. Tilapia could be one of the fish species.

According to **Fatimah Ferdouse**, INFOFISH, the small intraregional trade in Asia for tilapia is mainly with live and fresh forms. It is usually with neighbouring countries; from Malaysia and Indonesia to Singapore and from China and Taiwan to Hong Kong and South Korea. South Korean imports of frozen tilapia fillets increased from 710 tonnes in 2003 to nearly 2,000 tonnes in 2006. The Middle East is an important market for whole frozen tilapia, exported from East and South Asia. In domestic markets in Asia, the pink/red 'Cherry tilapia' is the only variety appealing to consumers in Asia's Far East. These are also sold in supermarkets as well as restaurants. In urban markets, the red tilapia is no longer considered a cheap fish and retail price has firmed up over the years.

Consumer and industry trends

In the US, the future will be portioned products for ready meals such as breaded battered and marinated and a larger variation in packaging. **Sherry Frey**, Perishables Group said, "The purchase of convenience foods has increased 50%. This means that pre-cooked, pre-portioned, value-added seafood products such as pecan crusted and stuffed tilapia are gaining shelf space at retail. The American household is shrinking and thus portions are smaller. But although consumers demand convenience, they are not willing to compromise freshness, quality and health".

She added that health is driving seafood purchases. In their survey, they found that more than a third of consumers demonstrated a desire to '*reduce the risk of developing health conditions*' and this affects the type of food. As Americans grow older, they look towards eating more seafood.

Eco labelling

This is a market based economic instrument to promote products deemed environmentally friendly than other competitively similar products, said **Tarlochan Singh**, INFOFISH. The first eco labeled products were sold in Germany in the 1970s. Eco label helps consumers identify a product with the desirable attributes at a glance. As the aim is to influence consumers' purchasing behaviour towards product attributes other than price, it could be seen as a technical barrier to trade. The benefit of consumer preferences for such products is price premium which in turn provides incentives for the producer to seek certification. It also allows access to new markets or protects existing markets. From the environmental perspective, it shows a measure of good and sustainable management practices. It was concluded that the herbivorous tilapia fed on mostly plant meals, hardy and relatively disease resistant and culture under organic/environmentally friendly farming methods lends itself easily to this market concept.

Branding tilapia

Taiwan was the largest exporter of the tilapia, especially to the US, until lower cost producers such as China dominated markets. In the 1980s, it exported whole frozen tilapia and later frozen fillets to Japan in the early 1990s with a price of USD12 per kg. **Frank Fu Sung Chiang**, National Taiwan Ocean University, said that the industry knew that it had to develop a marketing strategy, product branding, market diversification to survive. The Taiwan Tilapia Alliance was formed in 2002. The mission was to enhance competitiveness and profitability of its 500 members by pooling resources of industry, government and academia. In 2006, production was capped at 80,000 tonnes to maintain prices and ensure profitability of producers. It then went on to create a image of superior quality for a variety of tilapia by adopting a new Chinese brand name to replace the old name "Wu-Kuo Yu (fish)" and a logo (CIS). Promotions were through seafood shows and magazines. Through generic advertising, where costs is shared, it has successfully created consumer awareness in and outside Taiwan its products. Today, Frank said, "Taiwan Tilapia and Taiwan Izumidai is associated with high quality and produced under environmentally friendly conditions".

Hatchery at the PKPS Farm Mart. The farm was part of the post conference tour and was also featured in Aquaculture Asia Pacific. Vol 1 (6), 2005.

Commercial operations

Presentations in the section on experiences in commercial tilapia farming were by top management of companies, synonymous with successful integrated operations, local and global. Though relatively small and limited to Malaysia, **Yong Kim Tai**'s PKPS Farm Mart Sdn Bhd is a success story in the region. He runs this large commercial farm in partnership with the Selangor Agricultural Development Agency, a government linked body. The farm was started in 2000. The special characteristic of his tilapia produced in cement tanks after an initial phase in ponds is the absence of the 'muddy off flavour'. He brands his red hybrid tilapia as cherry fish. Fish is sold live in local markets and seafood restaurants.

Yong deduced that the solution for running a sustainable and profitable commercial tilapia farm includes a focus on what you are best in doing, continuous R&D, learning new ideas and knowledge from others and progressing to increase production efficiency and lowering costs of production.

Martin Sukkel, Chief Operating Officer, outlined the origins of Regal Springs Tilapia,from a farm in Indonesia 20 years ago. Today it is the world's largest vertically integrated tilapia producer with farms in Indonesia, Honduras and Mexico. Production is expected to reach 55,000 tonnes in 2007. In 2006, Regal Springs Tilapia was certified for organic tilapia production.

Regal Springs emphasizes on 'Environmental responsibility + Social Responsibility = Long Term Sustainability'. The focus is on keeping fish healthy with low density stocking so as to combat diseases. It monitors environmental impact via its own on-site laboratories and does social audits. In the Honduras, community projects include assisting with electricity supply, support for schools, restocking of water bodies for fisheries, education for adults and reforestation programs.

In Africa, Lake Harvest started from a pilot project to farm tilapia in ponds and net cages in Lake Kariba in Northern Zimbabwe. Today, it produces 3,000 tonnes annually of whole fish. **Patrick Blow**, General Manager since 1996 said that gaining acceptance for tilapia in Europe has been challenging because tilapia suffered many years from a 'poor quality reputation in European markets'. The success came with their efforts to produce high quality fresh fillets, transported three times a week to Europe. Their products are now found in more than 15 supermarkets chains in northern Europe. Some 50% of the products are marketed to Zimbabwee, Zambia, Botswana and South Africa as frozen whole fish fillets. This company does an environmental audit every three months.

In China's Hainan Island, HQ Sustainable Maritime Industries, Inc has built a successful integrated tilapia farming business in cooperation with farmers and the local government in Wenchang, said, **Norbert Sporns**, President and CEO. Hainan was chosen because of the environmental conditions with limited economic activities; agro food and tourism. This started in 1997. By controlling tilapia production such as stocking density, pond size, use of feed from certified ingredients, HACCP certification and other relevant certifications in post harvest processing , the company markets its 'toxin free' fish easily into international markets. Success has been in the marketing of various product forms such as boneless skin on fillets, boneless skinless fillets and whole round frozen. Boneless skin on tilapia fillets marketed under the label 'tailgate tilapia' was designed to tap into the barbecue craze in the US. In 2006, the company introduced 'Tiloveya', a brand label to several leading retail distributors and food services in the US.

On the sidelines of the conference, Norbert gave an overview of the vertical integration at HQS and introduced new business models for value adding tilapia products. (see box).

HQS – A unique business model in Hainan

Norbert Sporns, with a double degree in law from McGill University, Canada and married to Lillian Wang, daughter of an industrialist, has been active in China since the mid 1980s. They developed this unique farming model for the tilapia after consulting with experts in China and elsewhere In 2007, HQ was listed in the American Stock Exchange with the call letters HQS.

Contractual relationship

"In this vertical integration, we control all stages with the exception of the breeding portion. This is done by the local government, following a hormone free breeding method. They cross *Oreochromis aureaus* with *0. niloticus* and the result is a 90% male population. In the pond, the remaining 10% is removed partially by hand and partially by a predator fish (snakehead family) preying on females and unhealthy males. In the polyculture system deployed by the company, carp help to maintain good pond conditions by feeding off pond detritus".

In tilapia grow out, HQS taps into 20,000 tonnes of production for its processing plant.

"We train farmers with our culture methods, monitor quality and they provide us with their production. There are two crops per year. We only have production challenges in the early part of the year when the fish cost more, as it takes longer to reach the desired market size. Otherwise we can harvest tilapia year round in Hainan with the usual market size is 3-7oz fillet."

However, when HQS decides to shift a portion of its total output to organic production, HQS will be required to own the farms, as part of the requirement for organic certification by Chinese Organic certification authorities who deploy standards vetted by the FAO through the IFOAM.

"This is the evolution of the model for organic tilapia that if we are certified we will need to control production elements. Organic tilapia is such a wonderful concept. One of the challenging tasks that we have is explaining to people that tilapia is not a carnivore and does not create biodiversity problems. With tilapia and catfish as well, we are dealing with herbivore or at least omnivores that can thrive on a strict organic (fishmeal free) diet. We can control production parameters enough to achieve the classic organic standards and can attract a premium in the market. This is the way to attract consumers many of whom have a negative view on aquaculture because of environmental and biodiversity issues".

Feed models for 'we are what we eat'

Fish feed, comprising mainly soybean meal and corn, is produced in private feed mills but the company supervises the production process. It supplements feeds with vitamin E, distilled from palm oil and produced at its nutraceutical plant which was certified in 2001. As part of the vertical integration, there is a 100,000 tpy feed mill, under construction. This will allow it to have absolute control on quality of feeds, produce extruded feed which is gaining acceptance in Hainan as well as organic feeds.

"We are also building on the omega-3 egg model enriching feeds with omega 3 rich algae, which in the poultry industry can allow a doubling of the price of standard eggs. We do not expect to achieve this premium but certainly enough to more than cover the additional costs. We have calculated that the advantage outweighs the additional cost and is especially achievable through a strong branding and consumer awareness program".

"We also see vitamin E as a natural feed component. It increases the shelf life of the fish, increases vigour and reduces the need for antibiotics. Vitamin E added to the flesh is a supplement for consumers. There can be the advantage of labeling the product as meeting a certain percentage of vitamin E requirements in humans".

Drawing from the poultry experience

"US scientists see aquaculture facing the same marketing challenges as chicken and beef some 10-15 years ago. Markets are influenced by large chains such as Wal-Mart and McDonalds. They dictate that suppliers guarantee biosecurity and control all inputs in the production process. A company like Tyson produces its own feed, does the grow-out and processing and valued added and promotes its products through strong branding all the way to the retail shelf. This is the model (Tyson) for the future of aquaculture and for tilapia. We cannot control markets if we do not control the end result".

"We are vertically integrated in order to control all aspects of our operations- from the technologies that we share and monitor with our cooperative farmers to our state-of-the-art processing plant, to direct international marketing and branding. The role of our office in Seattle is an important part of the vertical integration. It handles marketing and branding and educates the public as to our toxin free approach".

"All these are capital intensive but being public listed we have access to funding. The disadvantage is that we share a lot of information. The benefits still outweigh the disadvantages".

Annual sales in 2006 totalled USD 39 million of which 61% was from aquaculture and fish processing operations.

The events you need to visit

Feed Ingredients & Additives Asia Pacific 2008

VICTAM ASIA 2008

EXHIBITIONS & CONFERENCES

5 – 7 March 2008 • Queen Sirikit National Convention Center, Bangkok, Thailand

Bringing together the world's premier suppliers of ingredients and processing technology to the animal feed, petfood, aquafeed, rice & grain processing industries with compounders, integrators, co-operatives, hatcheries, large farmers & grain processors from throughout the Asia Pacific markets.

Supported by the following technical conferences and workshops:

The FIAAP Conference 'The ingredients for success!'
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The Thai Feed Conference
Contact: chirawak@dld.go.th

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Victam Asia 2008 & FIAAP 2008

More than technology on display at this integrated feed event. Larger by 30%, exhibition space was added to meet demand.

March 2008 will see the opening of the largest integrated animal and aqua feed event. Victam Asia 2008, will be held together with Feed Ingredients and Additives 2008 (FIAAP 2008) exhibition and conference at the Queen Sirikit National Convention Centre, Bangkok, Thailand from 5 to 7 March 2008.

New to Asia, FIAAP 2008 will be the only dedicated exhibition and conference for feed ingredients & additives within South East Asia. Modern safety practices, processing methods and new ingredients impact on the feed process and the end product. It is for this reason that FIAAP 2008 was launched. The specific industry sector conferences will be particularly useful for nutritionists, formulators and veterinarians.

In December, Victam International held a press conference with the participation of local sponsors, invited exhibitors, local and foreign press. It announced that the exhibition space has been fully sold out. However, to meet requests from companies wishing to exhibit , the organisers have obtained additional space.

Henk van der Bunt, General Manager said, "Now we are already 30-35% larger in terms of exhibition space as compared to the show in 2006. This year, several companies have also multiplied their booth space. We are not at the end yet, we expect the number of exhibitors to increase by another 30%. So far 120 have committed to the show and will be displaying new equipment, process, formulation technology and ingredients that have not been seen before in SEA. For the first time, we were sold out well before the show."

"Usually after each show, we ask our exhibitors to give a ranking and in the last event they gave a higher ranking and this must be because they have made business contacts. In 2006, Victam Asia attracted 4,000 visitors from 51 countries, mainly from SEA."

"What is new this year is the two events under one roof. It will also be more exciting with the addition of the pet food forum. The US based publisher of the Petfood Magazine is bringing this forum for the first time to Asia, indicative of the booming petfood industry here. Then there is FIAPP. Business is also picking up in Asia and market is more confident".

Several speakers made short presentations on the company and on their activity at Victam 2006.

Thai feed industry

The spokesperson for the Department of Livestock Development, Thailand said, "In the last Victam show in 2006, we had an exhibition on the activities of the department and a plenary session on feed safety. For the forthcoming event, we will focus on standards of feed production and feed certification, such as GMP and HACCCP. This will also include information on residue monitoring control program and establishment of feed formulation registration. We will go on to discuss our role in global food safety from farm to fork. Another issue is feed substitute because of the competition of global feed market. We will be joined by the Feed Mill Association of Thailand and other academics."

Yongyuth Saksin, expert on nutrition from the Department of Fisheries, also a sponsor of the event, said, "Although feed represent 50-60% of production costs, the level of technology still needs improvement. At the show, DOF will concentrate on aquatic certification systems. With the cooperation of the public and private sectors, they will look into the development of organic feeds for tilapia in this niche market".

Dates and Opening Times		
Day 1	Wednesday, 5th March	10.00 – 18.00
Day 2	Thursday, 6th March	10.00 – 18.00
Day 3	Friday, 7th March	10.00 – 17.00
For further information on the exhibitions, conference programs, free visitor registration, etc visit the Victam website: www.victam.com E-mail: Andrew.west733@ntlworld.com		

Company presentations

Representing Thailand's **Triumph Engineering Co Ltd**, South East Asia's largest feed equipment manufacturer, Saopapak Kositkhun said that their participation at this show will be an opportunity to meet current and future customers and to exchange ideas. She added that Triumph, established two decades ago, has markets not only in SEA but as far USA, NZ and Japan. The products include hammer mills, extruders, pellet mills, crumblers, TVS screens, pulverisers, belt dryers and double shaft mixers.

Han van der Broek, **Kemira Asia Pacific Pte Ltd**, said that at the show, the Finland listed company will 'mark its permanent entry into the Asian market with its organic acids and acidifiers from the Specialty division'. Production of these are from three plants, in Finland, Netherlands and China. It is already world leader in feed acidifiers.

Buhler, a global leader in feed equipment with markets in 14 countries is expanding markets in Asia with a joint venture company in Jiangsu, China, said Urs Baumann, Managing Director for **Buhler Engineering Co Ltd**, Thailand. Following this will be a training school in feed technology similar to the SFT (Swiss Feed Technology) school, also in China. He added that for the first time, it will have a product portfolio specific for industry in Asia.

At the show, **Aeroglide**, specialist in conveyer dryers comprising 80% of its business will be making a larger presence in the aqua feed industry in Asia, said Paul Douglas, Regional Manager, Asia Pacific. It has always had a large presence in Victam's European shows. "Now we see that the processing of small particle feeds (starter diet of 0.8mm) and shrimp feeds (1.5 to to 1.8mm sizes) will be expanding with demand. To be efficient during the drying process, these cannot use the mainstream drying equipment. We will be there with customised drying solutions for this aquafeed segment. Regarding markets, we see expanding markets in China, Thailand, Vietnam, Indonesia, Malaysia and India".

The Netherlands based **Van Aarsen International B.V.** has been active in Asia with complete feed mills and advance feed milling equipment. Jos van der Berg, responsible for sales in Asia said, "The trends in feed manufacturing differ between countries in Asia. In Europe, government feed legislations rule and soon, similar trends are expected in Asia. In Europe, we have more than 300 formulas and as such automation is the key to efficiency. Automation is already crucial in Korean and Japanese feed mills. I would expect this to change in other countries too". In Asia, the company has built a complete feed mill in the Philippines and is starting another one in China.

Dinnissen, the Netherlands based company has more than 55 years of experience in bulk material, technology, machines development, processing, control, automation and engineering will offer stand alone machines as well complete turnkey systems. The strength is developing solutions for many applications and using tried and tested techniques. The company has a large business in extrusion plants for feed, aqua feed and petfood industries at 60% of turnover.

Stolz, France which developed the thermo hygienic conditioning system also brings turnkey solutions. Asia is a major market for Stolz which contributes 37% of its business. Since 1995, it has Stolz Miras based in Ho Chi Minh City, Vietnam which manufactures or assembles handling and key processing equipment for feed and grains. The product range also include hammermills, pellet mills, dryers, counter flow coolers and turbo sifters. It said that it has customised process automations for specific applications required by customers.

Feed Management Systems, the US based developer of solutions for the worldwide commercial feed industry has announced the release of Brill Formulation Version 2.0. The global feed nutrition and multi-blend software tool manages nutrients, ingredients, cost and feed formulas. This was a result of a 2 year project which consisted of reviewing customer suggestions, input from customer advisory meetings and extensive research on optimization of technology.

YeCherng Biotechnology said that with the green trends in the feed Industry, its strong R&D team has developed functional additives such as alternatives to antibiotics and chelated minerals. Other products are attractants, growth promoters and immune stimulants. The 5th generation chelated minerals are with amino acids. This guarantees optimal bonding strength between the mineral and methionine. It also demonstrates high stability during high temp feed extrusion process. In environmental management, it has microorganisms that assist in creating sustainable practices for aquaculture. It is used to maintain water clarity and to digest excess nutrients that cause fish kills. Ye Cherng is pursuing biotechnological approaches to low-cost production of antimicrobial peptides as alternatives to antibiotics.

Some highlights at the conferences

Aquafeed Horizons

- Aquafeed and Aquaculture Production and Policies in Thailand – Dr Juadee Pongmaneerat, DOF, Thailand
- Promoting Animal Health through feed – Peter Coutteau, Inve, Belgium
- Palatability Improvements in shrimp feeds – Dr Vincent Fournier, Aquativ, France
- Technical Advancements in Extruded shrimp feeds – Joe Kearns, Wenger, USA
- Starter Diet Production – Will Henry, Extra-Tech Inc, USA
- Beyond Preconditioning-reducing carbon footprint and increasing quality – Colin Mair

The full program is available from: http://aquafeed.info/_wsn/page2.html

FIAAP 2008

- Analysis of the Southeast Asia Animal Feed Additives Market- Sri Ganesh, consulting analyst with Frost & Sullivan Asia Pacific

Strict regulation by the European Union, threat of diseases, limited awareness about feed additives and cheap generic products are challenges facing the feed additives market in Asia Pacific. Sri Ganesh will present an overview of the animal feed additives market in Southeast Asia, in terms of unit value and volume. He will also discuss pricing trends and the factors involved in influencing the prices of feed additives. The geographical scope of the research presented comprises Malaysia, Thailand, Indonesia, the Philippines and Vietnam. Frost & Sullivan, in common with other industry analysts conclude that the future of the animal feed additives market in Southeast Asia will be in the non-antibiotic growth promoters' market segment.

Other highlights are

- Raw material Supply and Demand-Are they in Balance – Robert Swick, ASA, Singapore
- Digestible protein and amino acids content, value of terrestrial animal proteins for Aquafeeds – Dr Yu Yu, NRA, Hong Kong

The full program is available at http://www.feedconferences.com/

Bernaqua and Ocialis join forces in larval feed production

Evialis, a global animal nutrition company has acquired a 51% stake in Bernaqua, a larval feeds and larval products manufacturer. This is part of the company's emphasis on expanding its activities internationally, investing in R&D and developing Ocialis, its specialized brand for aquaculture.

Ocialis manufactures and markets aquaculture feeds in Europe, Asia and South America. Up to now, it was only offering grow out feeds for aquaculture. With this acquisition, it is able to propose products for all rearing stages in aquaculture and to develop the strategic market of larval feeds.

Bernaqua was founded by Bernard Devresse, a specialist in larval nutrition, who brought the company to its current position as a leader in Europe, in terms of volumes as well as in terms of technology. Evialis is a group of some 57 industrial plants, operating in 15 countries, marketing products and services in more than 50 countries. In 2006, it reached a turnover of Euro 637 million and employs more than 3,000 people.

More information: www.bernaqua.com; www.evialis.com; www.ocialis.com

Kiotechagil forms new distribution agreement in Asia

Agriculture to aquaculture specialists KiotechAgil which manufactures a range of products for the animal feed, grain and aquaculture industries has successfully concluded a new distribution agreement for Vietnam. This gives KiotechAgil an additional market in the region.

The agreement was signed with JJ- Degussa, itself a joint venture between Jebsen & Jessen and Degussa which was established in 1997. JJ-Degussa is headquartered in Singapore and has a number of offices in the region in addition to Vietnam. Director Mike Rogers said, "This is another important step for KiotechAgil in expanding our presence in this region. This is part of our strategy of taking our water sanitisation and anti-bacterial acids products as well as toxin and pellet binders to new markets."

Regional managing director Harry Kok, JJ-Degussa explained, "We have a wealth of experience in the feed sector supplying the Degussa amino acid range but are now looking to offer our customers additional 'value added' products. We very much see the KiotechAgil range as part of this process."

GAA forms SOC to advise on BAP Standards

The Global Aquaculture Alliance announced during its Global Outlook for Aquaculture Leadership 2007 conference that it will form a 12-member Standards Oversight Committee (SOC) to coordinate the development of its Best Aquaculture Practices (BAP) certification standards for aquaculture facilities.

In this revision of the BAP standards development process, the SOC will manage public input, oversee the process of developing standards and coordinate revisions to BAP standards. Its members will include equal representation from three key stakeholder groups: non-governmental conservation and social justice organizations, academic institutions and regulatory agencies, and industry. GAA Executive Director Wally Stevens said a number of conservation stakeholders participated in the conception and design of the Standards Oversight Committee structure. Their input was invaluable in this enhancement of the BAP standards development process.

While GAA has always sought input from a broad range of stakeholders in the development of its standards, it has come to recognize the importance of formalizing this process in a more structured and transparent manner.

"As aquaculture expands throughout the world, producers and marketers of cultured seafood products have recognized the benefits of broadly accepted standards that address a range of key issues – including environmental and social responsibility, animal welfare, food safety, and traceability," GAA President George Chamberlain said.

As the new SOC committee formalizes, nominations for its membership should be sent to BAP Standards Coordinator Daniel Lee (Email: or faxed to +44-0-1248-716729). Appointments to the SOC are expected to be made during the first quarter of 2008.

Exclusive distribution agreement for Aova Technologies

Aova Technologies, Inc. USA, (AovaTech) and Imgen, Inc., Japan have announced that they have entered into an exclusive distribution contract for the Japanese market to distribute the company's micro feed ingredient.

AovaTech is a biotechnology company formed in 2001 to commercialise the company's proprietary technologies and products to offer the producer and feed nutritionist a new strategy in animal nutrition. Aova's lead products- BIG PIG, BIG FISH, BIG BEEF and BIG BIRD are naturally produced dietary additives that result in greater nutritional performance for growing animals.

Imgen, Inc. is a biotechnology company located in Gifu City, Japan which develops, produces and distributes health products for the food and pharmaceutical industries. For the feed industry, it will focus on distributing Aovatech's products under this collaboration. According to Hideo Goshima, Representative Director, "Aovatech's products have great potential as feed ingredients for enhanced nutritional performance. We are sure that the BIG products will have a huge impact on the Japanese livestock industries."

Aova Technologies also announced in its newsletter that it has recently finished a successful nine-week rainbow trout study with the University of Idaho. An alternative source of protein, soybean meal, was used in conjunction wi th BIG FISH to determine a correlation with gut health. Traditionally, soybean meal cannot be used at high levels due to the inflammation it causes in the gut. Since the product attenuates inflammation the hypothesis is the two can be used in conjunction to solve this and reduce the overall cost of the diet. Growth, feed efficiency and histology data were collected as well. Concurrently, the company is awaiting the results of tilapia and shrimp trials conducted at the University of Auburn.

More information: www.aovatech.com

Elisa kits for residue monitoring from Tecna

Tecna Srl is an ISO 9001 company established in 1994. It conducts research in immunoassay and carries out development of innovative immunodiagnostics, compliant with European Union (EU) requirements. It is located in Italy's Trieste Area Science Park, a high technology research area that links universities and industry. The company continues to develop Elisa immunodiagnostic screening tools related to food safety. In the pipeline is the development of receptorial assay kits with wider screening specificities for a range of target molecules.

To address the aquaculture food safety issues, Tecna has introduced Elisa kits for chloramphenicol, sulphonamides, histamine, SuperTetra receptorial assay for tetracylines, oxytetracyclines and chlor-tetracyclines detection. In the near future, it will have Elisa kits for nitrofurans (AOZ and AMOZ). For myco-toxins contamination monitoring in feed, the company offers aflatoxins, ochratoxin, deoxynivalenol, fumonisins and zearalenone kits. It also provides comprehensive screening tools and together with regional partners, are extending the critical technical application support to the aquaculture industry. For more information: Email: export@tecnalab.com; web: www.tecnalab.com

Robin Liew, Malaysia, marketing Tecna kits at Livestock Asia 2007

Automated micro diet feeding system from Australia

Sagiv Kolkovski and the display model of the micro diet feeding system at Eurasia 2007 trade show

This was introduced by Dr Sagiv Kolkovski, Department of Fisheries, Western Australia at Eurasia 2007 as the first purpose built micro diet system for fish and shrimp larval feeding. The system includes an automatic controller and up to 24 feeders as the base system. It is fully programmable from a touch screen. It is completely plastic coated and comes with a one year warranty. It cost USD 11,000.

Sagiv explained the development of the system took three years and was with the participation of the Research and Development Corporation. The features of the feeder system are the large clear hopper which allows easy monitoring of the feed level, splash proof lid and the delivery of small accurate quantities of 0.1g per shot. It is capable of feeding 100 microns to 2 mm particles. An air line works to push air and disperse particles evenly across the tank systems and prevents these from clumping together. The base system has 24 boxes per control box but it is possible to add another 16. Feeding intervals are down to one minute but it will be possible to individually control feeding and with shorter intervals.

Some of the current users of this system are hatcheries in Tasmania, Gran Canaria, USA and TMSI in Singapore. Future markets for this systems will in regions where the demand is for less labour intensive systems. More information: www. fish.was.gov.au/amf/

New extruders from Jiangsu Muyang

China based Jiangsu Muyang has introduced the MY series of extruders. It has two new models of single screw extruder for the processing of floating fish feeds. These have a capacity of 3-9 tph and 8-15 tph, respectively. It also has two new models for its double twin screw extruders, designed for pet food, shrimp feed and fish feed production with a capacity range of 3-10 tph.

At the Livestock Asia 2007, Trade show in October, Liu Guang Dong, General Manager, International Trade said that in recent months, there has been an increase in the demand for extruders in Asia for fish feed production. As single screw extruders cost half that of twin screw extruders, most local companies have opted for single screw extruders and of high capacity for the processing of feeds for freshwater fish. In the case of Vietnam, demand for processing machinery will increase as fish feed production is targeted at 2 million tonnes. In India, their single screw extruders produce 10-15 tph of floating feeds. The minimum capacity for twin screw extruders is 3 tph but 500kg/hr machines are being used in universities for trial runs.

China is the largest market for the company and to date it has built more than 100 feed mills mainly for the top feed manufacturers in China. In the future, it will be looking at markets in South America and the Middle East. Jiangsu Muyang already has an office in Brazil and has recently set up two extruders for aqua feed production in Iran. The company also expects growth in sales in Indonesia and Thailand as more extruded fish feeds are being produced.

Jiangsu Muyang team at its booth. From left: Jack Ge, Liu Guang Dong, Wu Jinpu and Tony Peng

AE 2007, Istanbul 25 to 28 October

Aquaculture Europe 2007 looked at conflicts that aquaculture faces, globally.

AE 2007 was the European Aquaculture Society's conference linked with Future Fish EurAsia 2007. It was hosted by the Turkish Federation of Aquaculture and Fisheries (SUFED). Istanbul was an excellent location at the crossroads between Europe and Asia.

This year's theme "Competing Claims" referred to the different conflicts that aquaculture faces, not only in Turkey but globally, and upon which its future development will depend. These 'claims' arise from other stakeholders, with respect to physical space, financial and investment interests, tourism and development, as well as the usual environmental concerns. This issue is extremely relevant to Turkey which was expecting a total of 25 million tourists for 2007 and where coastal aquaculture (sea bass and sea bream) has increased by 20% in 2006 alone. Over the last 10 years, total aquaculture production has increased by 250% to 129,000 tonnes in 2006. There are 1,470 fish farms, 1,072 freshwater farms and 398 marine farms. Prior to 2000, most of the marine aquaculture was dependent on wild seedstock from the wild.

Today with the latest hatchery technology, Turkey even exports fry to other EU countries. Turkey now produces around 25% of the total sea bass and sea bream currently farmed in the Mediterranean. New government legislation is forcing marine farms that are within 1 km of the shoreline, to close or relocate away from any new developments that have sprung up all along the Aegean coast, which includes 70% of current farms. This legislation has been postponed now for a year, to give farmers a little breathing space.

The show and conference with almost 700 participants registered for the conference and 7,893 trade visitors was a big event. There were 265 companies from 29 countries exhibiting. Some 131 of these companies were international and mainly from Europe. From Asia, there was Pioneer A.E, Taiwan marketing its new cage systems (see Issue 6, 2007). Japan's Kinoshita Fishing Net Manufacturing Co Ltd introduced its fish cages made from brass.

Turkish exhibitors comprised mainly the large integrated operations. Turkey's leading trout producer, Bagci Balik, founded in 1981 has a production capacity of 5,000 tpy of trout. It is integrated with a feed factory and processing plant. Pinar Deniz Fish Farming plant was established in 1985 as the first integrated fish farming facility. The production capacity is 2,500 tonnes of seabass and seabream, 350 tonnes of mussel and 60 million fry. Some 50% of total sales is exported to Spain, Italy and other European countries. Fjord Marin Turkey established in 1995 and purchased in 2002 by Fjord Marin ASA (a joint venture with Selonda SA) is integrated with hatcheries, on-growing sites and fish packing facility. The production capacity of sea bream and seabass is 6,000 tonnes. Cagatay Yem Sanayii produces feeds of pellet size ranging from 1mm to 20mm for the seabream, seabass, trout, red sea bream, sturgeon, carp, salmon and tuna. Abalioglu has a 35,000 tonnes capacity for feeds for the trout, carp, seabass and seabream.

During the opening, Mehdi Eker, the Minister of Agriculture and Rural Affairs gave an overview of aquaculture in Turkey. In 2006, it produced 40,000 tonnes of trout and 50,000 tonnes of sea bass and sea bream. These are mostly exported to Greece, Italy, Spain, UK, France and Holland. There are 25,000 people employed in the industry. New species include seatrout, sturgeon, catfish, red sea bream, turbot white grouper and eels. Turkish hatcheries have also diversified and are producing meagre, white grouper, dentex, and sharp snout sea bream larvae. There are also significant increases in organic farming using semi intensive, extensive or recirculation systems. He said that any expansion of the aquaculture industry in Turkey would involve offshore marine farms, and recirculation technology for land based farms. It is also drawing direct foreign investments. Nireus, Greece's largest aquaculture company, and listed on the Athens stock exchange, has recently purchased a large Turkish sea farm.

There were several workshops conducted prior to the conference, Aquamax, an EU funded integrated project on aquaculture feeds, Recirculation technology, and European Eel Reproduction. Turkish participants attended the Turkish Academic day and the Turkish farmers day. The conference itself had several grouped topics, all of which led with a plenary lecture presented by experts in the field. Oystein Dahle (chairman of the World Watch Institute) gave the first plenary "Does Aquaculture make efficient and sustainable use of limited issues" where topics such as food security, fishmeal supplies and water shortages were covered. On the last day, Karen Brunso (University of Aarhus Denmark) asked "How to address consumer expectations and concerns?"

This conference not only highlighted the problems facing the industry, but also looked at the solution to these problems. Future Fish Eurasia has proven to be the show of the region forming the bridge between the European and the Asian markets. The next Future Fish Eurasia will be in October 2008. (The article was contributed by Eric Roderick, Fishgen, UK).

Hasan Girenes, Yasar Group, Turkey (centre) with Ronnie Tan, Malaysia and Piet Verstraete, Belgium.

Pedro Encarnacao Biomin, Singapore, Ms Ozlem Gurel, Pinar Feed Co, Turkey and Herve Lucien Brun, Aqua Techna, France

Seabass from Pinar Balik

Innovation at Skretting Australasian Aquaculture 2008

Skretting Australasian Aquaculture 2008 International conference and trade show will take place in Queensland, at the Brisbane Convention and Exhibition Centre from 3-6 August 2008.

This year's Australasian Aquaculture with the theme, 'Innovation in a Global Market' will bring together more than 1,500 international participants to share knowledge and showcase aquaculture's best innovations. It will provide a forum for aquaculture farmers, equipment suppliers, scientists, educators and government regulators to meet and discuss advances in aquaculture. This event is hosted by the National Aquaculture Council of Australia (NAC) and supported by the Australian Prawn Farmers Association, the Australian Barramundi Farmers Association and the World Aquaculture Society's Asia-Pacific Chapter (WAS-APC). It is sponsored by Skretting and the FRDC.

Some exciting developments in the Asia Pacific region will be presented. Participants will also have the chance to meet with Australia's innovation forerunners. At the trade show, over 130 trade booths are planned and at press time, almost 25% have been sold. Three plenary sessions over three days will be a first for the Australasian Aquaculture conferences.

Themes will be

- Innovation in Global Marketing
- Innovation in Sustainability and
- Innovation in Production.

The Call for Papers brochure outlining preliminary program highlights has been released in Australia, New Zealand and the Asia Pacific. This brochure provides an early notice of the conference (overview, registration and program) as well as requirements for submitting abstracts. Details of oral and poster presentations must be submitted by **25 January 2008**.

More information on the conference:
Contact: Conference Coordinator: Sarah-Jane Day
Email: sarah-jane.day@aquaculture.org.au; Tel: +61 402 047 830

Giant Malaysian Prawn 2008

This 2 day seminar on the Giant Malaysian Prawn, *Macrobrachium rosenbergii*, organized by the Malaysian Fisheries Society has received widespread attention from scientists and industry in the region. Scheduled for 28-29 March 2008 in Kuala Lumpur, Malaysia, it is supported by several universities, the Fisheries Development Authority and Department of Fisheries Malaysia. Some 150 participants are expected for this 2 day event. A field trip to a hatchery will be organised.

Including this as part of it annual activity, the society aims to initiate an exchange of information and ideas on the various aspects of the farming this species. It will bring together scientists and professionals to deliberate on the issues affecting its commercial farming. The program will include presentations on genetics, breeding, culture, nutrition, economics and marketing.

Some of the topics covered and speakers are as follows:

- Giant freshwater prawn culture in China by Professor Chen Qing Chao, South China Sea Institute of Oceanology, China
- Genetic diversity of *Macrobrachium rosenbergii* in Malaysia by Dr Zainoddin Jamari, Department of Fisheries, Malaysia
- Genetic diversity in *Macrobrachium rosenbergii*: Has wild genetic variation been captured and exploited successfully in cultured stocks? – Dr Peter Matter, Queensland University, Australia
- Culture of *Macrobrachium rosenbergii* – Dr Jane Hugh, Queensland University, Australia
- Techniques in larval rearing in India by Indulkar Rai, Dr. B. S. Konkan Agricultural University, India
- Research on the freshwater prawn in the Philippines by Maria RR Romana-Eguina, Seafdec, Phillippines.

In addition to the seminar, there will be a small trade show. Updates will be available in the second announcement available end January. For more information, Web: www.vet.upm.edu.my/~mfs/ or email: myfisoc@gmail.com

What to expect in AQUACulture Asia Pacific Magazine in 2008

Issue	January/ February	March/ April	May/ June	July/ August	September/ October	November/ December
Focus on current trends & challenges	Aqua Feed Production	Disease & Health Management	Food Safety	Sustainable Aquaculture	Organic Aquaculture	Cage Culture
Industry review	Marine shrimp	Marine fish	Catfish	Tilapia	Freshwater prawn	Hatchery
Features on success stories, best practices, new technology and developments						
Feed technology NEW	Enzymes & feed additives	Feed processing	Immuno-stimulants & Feed ingredients	Novel protein meals & amino acids	Nutrition & Formulation	Extrusion & Larval feeding
Technical	Culture technology	Recirculation technology	Product quality & markets	Biotechnology & diseases management	Pre & Pro-biotics	Health management/ Larval feeding
Shows	Victam & FIA Asia 2008	World Aquaculture 2008	Vietfish 2008	Australasian Aquaculture 2008	Aquaculture China	

January 27-February 1
18th Practical Short Course on Feeds and Pet Food Extrusion
Texas A&M, USA
Email: mnriaz@tamu.edu
Web: www.tamu.edu/extrusion

February 8-10
India International Seafood Show 2008
Kochi
Email:premchandran@mpeda.nic.in
Web: www.mpeda.com

February 9 – 12
Aquaculture America
Lake Buena Vista, Florida
Email: worldaqua@aol.com
Web: www.was.org

March 5-7
Victam Asia 2008/
Feed Ingredients & Additives Asia Pacific
Bangkok, Thailand
Email : andrew.west733@ntlworld.com
Web: http://www.victam.com/asia.php (p37)

March 6
Aquafeed Horizons Asia 2008
Bangkok, Thailand
Email: conferences@aquafeed.com
Web: www.aquafeed.info

March 28-29
Giant Malaysian Prawn 2008
Kuala Lumpur, Malaysia
Email: myfisoc@gmail.com
Web: www.vet.upm.edu.my/~mfs (p15)

May 13-14
Aquaculture Feed Extrusion, Nutrition and Formulation
Florida, USA
Email: aquafeed@scarlet.be
Web: www.membraneworld.com

May 19-23
World Aquaculture 2008
Busan, Korea
Email: worldaqua@aol.com
Web: www.was.org (IBC)

June 1-5
XIII International Symposium on Fish Nutrition and Feeding (ISFNF)
Florianópolis , Brazil
Web: www.isfnf2008.com.br

June 12-14
Vietfish Fisheries International Exhibition
Ho Chi Minh City, Vietnam
Email:quocthanh@vasep.com.vn
Web: www.vietfish.com.vn

June 22-26
DAA VII-7th Symposium on Diseases in Asian Aquaculture
Taipei, Taiwan
Email: daaseven@gmail.com
Web:
http://homepage.ntu.edu.tw/~daaseven/index1.htm

July 25-27
The Seventh International Conference on Recirculating Aquaculture
Roanoke, VA, USA
Email: aqua@vt.edu
Web: www.cpe.vt.edu/aquaculture/r-aqua/

August 3-6
Australasian Aquaculture 2008
Brisbane, Australia
Email: sarahjane.day@aquaculture.org.au
Web: www.australian-aquaculturereportal.com (p30)

October 12-14
8th International Symposium on Tilapia in Aquaculture
Cairo,Egypt
Web:
http://ag.arizona.edu/azaqua/ista/ISTA8/ISTA8.htm

2008

List your events in AQUA Culture AsiaPacific Magazine for FREE. Fax details to: +603 2096 2276 or email to the Editor at zuridah@aquaasiapac.com

World Aquaculture 2008

Aquaculture for human wellbeing- the Asian perspective'

This is the theme of this event. It will be the first major international aquaculture conference in Korea. It will also be the first chance for the international aquaculture community to visit Korea and see the diverse and rapidly expanding aquaculture industry in the country and learn about developments in the rest of Southeast Asia and around the world. At the international trade show, visitors can see the newest technology presented by exhibitors from around the world. Farm tours will visit flat fish, sea bream, sea bass and black rockfish farms.

There will be a special Farmer's Day with the latest in practical knowledge for the Korean aquaculture producers. The main event is hosted by the Korean Aquaculture Society and KBMBX.

Sessions and workshops at World Aquaculture 2008 will cover all aspects of aquaculture in Korea as well as the rest of the world. Topics will include:

- Human wellbeing such as safety & security, functional foods and nutriceuticals & organic aquaculture
- Crustacean culture including shrimp feeding & nutrition, shrimp biosecurity & health management etc
- Sustainable production systems including recirculating systems, bioremediation through integrated aquaculture and offshore aquaculture
- Marine and freshwater finfish culture covering, finfish hatchery and nursery, broodstock maturation and grouper, tuna, flatfish, cobia & sturgeon
- Mollusc culture including broodstock and hatchery and grow-out production systems
- Economics and marketing

World Aquaculture 2008 will be held at the Busan Exhibition & Convention Center from 19-23 May, 2008. Register by March 7, 2008 and April 4, 2008 to receive special rates.

For more information: World Aquaculture 2008, Conference Manager, P.O. Box 2302, Valley Center, Ca 92082, USA Tel: +1-760-751-5005, Fax: +1-760-751-5003, Email: worldaqua@aol.comWeb: www.was.org

WORLD AQUACULTURE 2008

Aquaculture For Human Wellbeing-The Asian Perspective

May 19-23, 2008

Busan Exhibition & Convention Center
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Korean Aquaculture Society & KBMBX

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FOR MORE INFORMATION CONTACT:
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www.was.org

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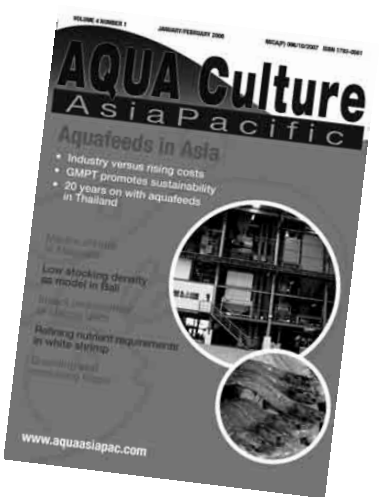

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