English Monthly from Hyderabad, India

RNI Regn. No. 52899/93

Aqua International

Estd. 1993

Health • Nutrition • Management • Processing

July 2022

Annual Subscription: Rs 800 Foreign $ 100

Inside...

Editorial:

National Green Tribunal directs CAA to put an end to all illegal coastal aquaculture activities in violation of Coastal Aquaculture Authority Act, 2005

Udaya Ram Jothy passes away

Farmers urge Kerala government to regulate aquaculture sector

L. Barman, the successful beginning of an energetic fish farmer

Economic incentives drive the conversion of agriculture to aquaculture in Indian Sundarbans

Odisha signs MoU to promote Bhetki fish

Recirculatory Aquaculture System: Way forward to Intensive and Sustainable Aquaculture Production

Biosynthesis of nanoparticles – A new horizon in Fish biomedicine

SDC Solutions for optimizing your Aquaculture business performance

HEALTHY ANIMALS, HEALTHY FOOD, HEALTHY WORLD

Pervic-A™

Ultimate high level Disinfectant

SDC Biobac-N®

Water & Soil Probiotic

ODOCLEAR-A40®

Natural protection for super natural growth

For Details Contact:

SDC AGRO-VET (INDIA) PVT. LTD.,

#103 & 104, SDC HOUSE, D. NO. 12-13-97, Tara Tycoon,Tarnaka,
SECUNDERABAD-500 017. T.S. INDIA.
Ph: +91-40-27006075, Fax : +91-40-27006076.
email : info@sdcagrovet.com www.sdcagrovet.com

An ISO 9001 : 2015 Certified company

SDC Products Registered with CAA as Antibiotic-free product

Aqua International

English Monthly Magazine
(Established in May 1993)

Volume 30 Number 03 July 2022

Editor & Publisher
M. A. Nazeer

Editorial & Business Office:
AQUA INTERNATIONAL
NRS Publications,
BG-4, Venkataramana Apartments,
11-4-634, A.C.Guards,
Hyderabad - 500 004, India.
Tel: 040 - 2330 3989, 96666 89554
E-mail: info@aquainternational.in
Website: www.aquainternational.com

Annual Subscription
India : Rs. 800
Foreign Countries : US $ 100
or its equivalent.

Aqua International will be sent to the subscribers in India by Book Post and to the foreign subscribers by AirMail.

Edited, printed, published and owned by M. A. Nazeer and published from BG-4, Venkataramana Apts., 11-4-634, A.C.Guards, Hyderabad - 500 004, India. Printed at Srinivasa Lithographics.
Registered with Registrar of Newspapers for India with Regn. No. 52899/93. Postal Regn. No. L II/ RNP/HD/1068/2021-2023.

NRS PUBLICATIONS
www.aquainternational.in

CONTENTS

Editorial

11. National Green Tribunal directs CAA to put an end to all illegal coastal aquaculture activities in violation of Coastal Aquaculture Authority Act, 2005.

News

14. L. Barman, the successful beginning of an energetic fish farmer.
16. Farmers urge Kerala government to regulate aquaculture sector.
16. Bench forms Monitoring Committee to supervise the action taken by the authority near Pakkam.
18. Aquaculture practices launched at Kochi airport's golf club.
18. International Health Care Ltd participates in NIPOLI EXPO at Ibadan-Nigeria.
20. Odisha signs MoU to promote Bhetki fish.
22. Soyabean output likely to be below govt estimates: SEA.
24. Economic incentives drive the conversion of agriculture to aquaculture in the Indian Sundarbans.
28. Insect farming under fire as new fish welfare benchmark is launched.
30. Udaya Ram Jothy passes away.
32. My feelings: Subrato Ghosh.

Articles

36. Recirculatory Aquaculture System (RAS): Way forward to Intensive and Sustainable Aquaculture Production.
40. Biopesticide: an Ecofriendly Approach to the Aquaculture Practice.
44. Biosynthesis of Nanoparticles - A New Horizon in Fish Biomedicine.
48. New technology to allow fleets to double fishing capacity and Commercial fishing - at a glance.
50. Fish processing as Zero-Waste Food Industry.

ADVERTISERS' INDEX

Angel Yeast Co Ltd	BC	Mettler Toledo	27
B K M N Aqua	37	Nandini Gears	6 & 7
Biofera	53	Nihal Traders	49
Biomed Techno Ventures	4	Poseidon Biotech	33
Buhler India Pvt Ltd	54	Poseidon Microbasia	21
Compro China Ltd	13	SDC Agrovet (India) Pvt Ltd	3
Deepak Nexgen Foods & Feeds Pvt Ltd	43	Shandong Longchang Animal Health	55
Doctor's Vet-Pharma Pvt Ltd	23 & 25	Soon Strong Machinery Works Co., Ltd	31
Famsun Co Ltd	10	Skretting West Coast Pvt Ltd	41
FECPI India Pvt Ltd	39	Sribs Biotechniqs Pvt Ltd	2
Gentle Bio-Sciences Pvt Ltd	5	Team Agrotech Pvt Ltd	47
Golden Marine Harvest	8	The Waterbase Limited	FC
Hitech Life Sciences Pvt Ltd	17	Uni-President Vietnam Co. Ltd	15
K.G.N. Hatchery	29	Zhanjiang Hengrun Machinery	34 & 35
Megasupply Co.	19		

Subscriptions for Aqua International, English monthly, should be sent to:
The Circulation Department, Aqua International, BG-4, Venkataramana Apartments, 11-4-634, A.C.Guards, Near Income Tax Towers, Hyderabad - 500 004, India. Email: info@aquainternational.in

FAMSUN

Integrated Solution Provider

Vacuum coater

Exceptional design & Flexible operation

Vacuum coater for the application of oil or fat, pigments, flavors, functional improver, vitamins, etc. onto pellets after drying and/or cooling. Aquafeed and pet food in particular.

FAMSUN Co., Ltd.

Add: No.1 Huasheng Road, Yangzhou, Jiangsu, China 225127
T:+86-514-87848880
E-mail:mypublic@famsungroup.com
www.famsungroup.com

India Office

Add: No 401 , Dega Towers , Raj Bhavan Road , Somajiguda , Hyderebad , Telangana - 500082
T: +62-21-30027458; 30027459
Contact: Arun Kumar K
E-mail : arunkumar@famsungroup.com
Mob: +91 9901916554

Contact: Shelby
E-mail: lxb@famsungroup.com
Mob: +91 9100436652

National Green Tribunal directs CAA to put an end to all illegal coastal aquaculture activities in violation of Coastal Aquaculture Authority Act, 2005

Aquaculture farmers in Kerala have appealed to the State government to intervene to regulate fish farming in the State in such a way that the farmers receive remunerative prices for the produce and to ensure that fair practices are followed.

Recirculatory aquaculture system is a high-density culture technique by using limited resources. In this system, water is recycled and reused after proper filtration and is done in indoor / outdoor tanks in a controlled environment. With RAS, the fish production can be increased upto 30-50 folds compared to conventional farming methods. Due to lack of expertise and high capital investment, this technology has yet to attain commercial scale adoption.

Dear Readers,

The July 2022 issue of *Aqua International* is in your hands. In the news section you may find news about ...

Mr Udaya Ram Jothy, Promoter and Managing Director of A.A. Biotech Pvt Ltd passed away in Chennai on 30 June 2022 due to cardiac arrest. Udaya Ram, M.Sc, with mariculture from Kochi established A.A. Biotech Pvt Ltd in 2004 at Chennai, India primarily to meet the essential requirements of aquaculture healthcare sector and made a mark in Indian Aquaculture industry with his quality products and services. He did his business with ethics and principles and is known for man of commitment and trustworthiness. His customers were satisfied with his products and commitment. Udaya Ram was the President of Society of Aquaculture Professionals (SAP) during the period 2012 to 2014. With his untimely demise, the Indian aquaculture industry lost a good and upcoming entrepreneur.

Mr Lakshman Barman, carp hatchery-cum-fish farmer of Sitalkuchi Block in Coochbehar District, West Bengal aged just 36 years, aims to widen his carp seed production facilities and set up mini fish feed mill with Government support. He is innovative, enthusiastic and hard-working, seeks to gain new skills and ideas, learnt techniques and obtained necessary advice from reputed elderly fish farmer of North Bengal. Mr Barman attempted in pond farming of the prized riverine Boroli fish of North Bengal in 2017 with 1.0-1.5cm seeds collected from Dharala river in January-February. He experienced that original Boroli Barilius barila seeds mostly do not survive for long in farm ponds. He is one of the successful beginners of an energetic fish farmer.

Aquaculture farmers in Kerala have appealed to the State government to intervene to regulate fish farming in the State in such a way that the farmers receive remunerative prices for the produce and to ensure that fair practices are followed. According to the Kerala Fish Farmers' Association, there are around 12,000 registered fish farmers in the State and also others who take up fish farming without licence. The activity, like dairying, had become a means of livelihood for such people. Several farmers used slaughterhouse and poultry waste as feed for the fish while others depended only on fish feed available in the market. There are differences in the cost of production in the two practices. Farmers are also cultivating genetically improved farmed tilapia as well as other fishes.

National Green Tribunal has directed the Coastal Aquaculture Authority, Chennai, to put an end to all illegal coastal aquaculture activities in its jurisdiction being carried out without registration or in violation of the Coastal Aquaculture Authority Act, 2005. The Bench noted that enforcement was "highly inadequate" at the

Contd on next page

NRS GROUP
Aqua International

Our Mission

Aqua International will strive to be the reliable source of information to aquaculture industry in India.

AI will give its opinion and suggest the industry what is needed in the interest of the stakeholders of the industry.

AI will strive to be The Forum to the Stakeholders of the industry for development and self-regulation.

AI will recognize the efforts and contribution of individuals, institutions and organizations for the development of aquaculture industry in the country through annual Awards presentation.

AI will strive to maintain quality and standards at all times.

TALK TO US

SEND AN EMAIL:
info@aquainternational.in
Please do not send attachment.

FOLLOW US:
facebook.com/aquainternational.nrs
twitter.com/nrspublications

Send a letter: *Letters to the Editor must include writer's full name, address and personal telephone and mobile numbers. Letters may be edited for the purposes of clarity and space. Letters should be addressed to the Editor:*

AQUA INTERNATIONAL, BG-4, Venkataramana Apartments, 11-4-634, A.C.Guards, Near Income Tax Towers, Masab Tank, Hyderabad - 500 004, T.S, India.
Tel: +91 040 - 2330 3989, 96666 89554. Website: www.aquainternational.in

moment and unregistered aquaculture activities were found in abundance. The Bench directed the authority to initiate prosecution against the violators and assess compensation for past violations. The directions came in a case related to illegal prawn culture aqua farm activities at Pakkam village in Tiruvallur district, near the Chitteri waterbody, which is a source of drinking water to Chennai. The waterbody is part of the Pazhaverkadu Bird Sanctuary and close to Pulicat Lake.

Cochin International Airport Ltd has introduced aquaculture practices in the water bodies at its golf club at Nedumbassery. The Marine Products Export Development Authority and the Rajiv Gandhi Centre for Aquaculture have joined hands with CIAL for eco-friendly, sustainable cage farming in the water bodies. CIAL, Managing Director, Mr S. Suhas said that aquaculture offers many environmental benefits related to other forms of livestock farming. Over the last five years, the aquaculture industry has reduced its carbon footprint through gradual assimilation of new production systems that have reduced greenhouse gas emissions, reduced the use of freshwater per unit produced, improved feed management practices and adopted new farming practices. As sustainability champions, CIAL strives for climate-friendly practices that generate sustainable environmental, social and economic outcomes for the long term.

The Odisha Government has signed a memorandum of understanding with the Rajiv Gandhi Centre for Aquaculture, the research and development arm of the Marine Products Export Development Authority in the ministry of commerce and industry, to set up a hatchery for the mass production of Bhetki fish seeds. Bhetki is a much sought-after fish in the state after Hilsa and Rohu. While Hilsa is not affordable for the common man because of its high price, Rohu is cheaper. For Hilsa, Odisha state still depends on the Bengal market.

The Solvent Extractors' Association of India feels that the Soyabean crop is likely to be lower at 10 million tonnes against the government's estimate of 13.83 mt. Atul Chaturvedi, President, SEA, in his monthly letters to its members said the Union Ministry of Agriculture and Farmers Welfare's third advance estimate for major crops had estimated the oilseeds output at 38.5 mt. It was at 35.95 mt during the last year. Stating that these are good tidings, he hoped that oilseed production would continue growing in the coming years. According to the government estimate, the Soyabean crop is at 13.83 mt, and the rape-mustard seed crop at 11.75 mt.

Aquatic Life Institute launched a benchmark tool to evaluate six of the most well-known, global aquaculture certification schemes and their effectiveness with respect to aquatic animal welfare standards. These certifiers included Global Animal Partnership, RSPCA assured, Naturland, Friend of the Sea, Global GAP and Best Aquaculture Practices. The report recognises the newly released Global Animal Partnership Atlantic Salmon Welfare Standard "as the most welfare-comprehensive standard to date. This standard incorporates the latest science-based interventions to improve welfare for farmed salmon. According to ALI, insect farming is a potentially significant industry of concern due to the unknown animal welfare consequences and negative environmental impacts throughout the production cycle.

In the Articles section – *Recirculatory Aquaculture System: Way forward to Intensive and Sustainable Aquaculture Production* *authored by* Detty Nebu, Monica K.S., Dr Rakesh K. and Dr Ganapathi Naik M., Department of Aquaculture, College of Fisheries, Mangaluru discussed that Recirculatory aquaculture system is a high-density culture technique by using limited resources. In this system, water is recycled and reused after proper filtration and is done in indoor / outdoor tanks in a controlled environment. With RAS, the fish production can be increased upto 30-50 folds compared to conventional farming methods. Due to lack of expertise and high capital investment this technology has yet to attain commercial scale adoption.

Another article titled ***Biopesticide: An Ecofriendly Approach to the Aquaculture Practice,*** *authored by* Suman Karmakar, Susmita Jana, Sushree Akankshya Das, Bhagchand Chhaba and Gora Shiva Prasad, Department of Aquatic Environment Management, Faculty of Fishery Sciences, West Bengal University of Animal and Fishery Sciences, Kolkata, said that Biopesticide is one type of eco-friendly pesticide which is mainly derived from natural material such as animals, plants and microbes. Nematodes, plants (e.g. Chrysanthemum, Azadiracthaindica), microbes (e.g. Bacillus thuringiensis, Tricoderma, Nucleopolyhedrosis virus) which are the parental material of biopesticides.

Article titled ***Biosynthesis of Nanoparticles - A new horizon in Fish Biomedicine,*** *authored by* M. Dhayanath and Abisha Juliet Mary. S. J, Department of Aquatic Animal Health Management, Central Institute of Fisheries Education, Mumbai, informed that the biogenic nanoparticle is becoming a significant potential technology as the result of phytomining which revealed that metals are usually deposited in the form of nanoparticles. The various biological agents in the form of algae, plants and microbes have emerged as an efficient candidate for the synthesis of nanoparticles. These biogenic nanoparticles are cost efficient, simpler to synthesize and focus towards a greener approach.

Another article titled ***New technology to allow fleets to double fishing capacity and Commercial fishing -- at a Glance,*** *authored by* **Dr Jaya Naik**, Dept. of FET, Fisheries College, KVAFSU, Mangaluru, said that Industrial fishing fleets have doubled the distance they travel to fishing grounds since 1950, which means that they are now able to reach 90 percent of the global ocean, but are catching only a few tons for each of the fishing vessels registered under the concerned state governments. Commercial fishing is the activity of catching fish and other seafood for commercial profit, mostly from wild fisheries.

Article titled ***Fish Processing as Zero-Waste Food Industry,*** *authored by* Itishree Das, P.G. Scholar, Fish Processing Technology Department, Dr A.K. Balange, Principal Scientist, Fish Processing Technology Department, Dr Layana P, Scientist, Fish Processing Technology Department, ICAR-CIFE, Mumbai and Mr Sandeep Shankar Pattanaik, Assistant Fishery officer, Odisha, discussed that as one of the topmost growing sectors globally, the aquaculture and processing industry is developing rapidly. With the increase in its products, the processing industry also produces many by products.

Readers are invited to send their views and comments on the news, special feature and articles published in the magazine which would be published under "Readers Column". Time to time, we shall try to update you on various aspects of Aquaculture sector. Keep reading the magazine Aqua International regularly and update yourself. Wish you all fruitful results in your efforts.

M.A.Nazeer
Editor & Publisher
Aqua International

Compro®

WhatsApp

WeChat

Welcome Distributor to Join us

Recruitment of Sales Representative

Napro® WT (Probiotics)

- Improve water quality & clarity
- Remove odors like ammonia & nitrite & nitrate
- Boost immune system of aquatic animals
- Strengthen resistance against diseases
- Enhance digestion & absorption of nutrients in aqua feeds

Compro (China) Limited

China Bio-Medicine Park,
Beijing 102600 China

+86 10 5952 8253

info@compro.cn

www.compro.cn

L. Barman, the successful beginning of an energetic fish farmer

Kolkata: Sitalkuchi Block Development Office in Coochbehar district in north Bengal is one of the few farthest points (710 kms by road) from Kolkata city within West Bengal. More remote is the location of carp hatchery-cum-fish farm of Mr Lakshman Barman, aged 36 years, very energetic and dedicated to carp breeding and seed production in hatchery and pisciculture. News communicator Mr Subrato Ghosh and Mr Himadri Chandra spoke with Mr Barman at his farm site on June 25, who is the only fish breeder-cum-fish farmer by profession in Sitalkuchi Block and one among only few progressive fish breeders (hatchery owners) in Coochbehar district.

Mr Barman possesses 8 fish ponds on lease (each 60 to 180 dec) near his home at Rangamati Mouza (village), Borokoimari Gram Panchayat, Block and PS Sitalkuchi and has recently taken 4 additional ponds (area 600 dec) at Chhotosalbari GP at 4 km distance from the former; all for carp broodstock maintenance, egg incubation, nurturing of hatchlings and spawn production in hapa, carp fingerling production and also marketable-sized fishes. He is actively-operating water storage tank, concrete broodfish holding tanks, two big carp breeding (spawning) pools (Chinese structure), one egg-incubation-cum hatching pool, all having water sprinklers (his own devise and indigenous method), 20 nos of cloth

Lakshman Barman (in middle) at his farm premises

hapa fitted in one of his pond where egg incubation and spawn production mostly done for Indian major carps and Puntius javanicus. Stripping method not followed. Fertilized eggs are stocked in hapa enclosures.

He started in 2016 and presently supplies carp spawn to 160-220 nos of fish farmers (his customers) at Dinhata, Mathabhanga-I, Mathabhanga-II and Sitalkuchi Blocks in Coochbehar in every fish breeding season.

Right from birth of carp hatchlings, growing hatchlings from one hapa are carefully transferred to new hapa in every 24 hours till spawn stage. Ten Bati spawn (60-70ml Bati, holding 10000-15000 nos) are produced from each hapa in every operation. In 2nd week of March, he sells IMC spawn (100% pure species) @ Rs 550 - 600 per Bati and price falls to Rs 250 - 350 per Bati towards end of season in end of May. He has observed no buyers of carp spawn from him (no customers) from 1st week of June and thereafter, so his carp breeding and spawn production season extends from mid-March till 3rd - 4th week of May every year. At his hatchery, he keeps 1 - 2 Bati spawn (72 - 75 hour old) in each and every oxygenated polythene packet having 8 lit water and sells it to fish farmers. Nine labours work under him.

In end of May or early June, he propagates the unsold amount of IMC spawn by stocking in properly-managed nursery-cum-rearing ponds with proper feeding, which attains 3 inch size at the end of 35 - 45 days. Thereafter he stocks these early fingerlings in his grow-out culture ponds and are harvested in October. From mid-October onwards till February next year, most of the ponds here hold only very little water. Summer season in this part of WB (Sitalkuchi Block) is short and markedly less hot in comparison to other parts of WB, one will feel cold in night hours in end of May (a contrasting condition to Kolkata and districts in southern Bengal). Sitalkuchi doesn't experience high temperature at any time of a year. For P. javanicus, 300 - 750 gm males and upto 1400 gm females are selected for hormonal injection. He observed its egg incubation period to be 8 - 10 hours in April-May and 15-16 hours in March (less warmer water). Mr Barman has invested into another carp hatchery complex at Chhotosalbari GP just beside Dharala river, which is under construction (two egg incubation pools, squarish broodfish holding tanks, water reservoir) and will be operated using river water. Carp egg incubation will be done in concrete double-chambered conventional hatching pools and four cylindro-conical hatching units made of galvanized iron. Mr Barman attempted in pond farming of the prized riverine Boroli fish of north Bengal in 2017 with 1.0 - 1.5cm seeds collected from Dharala river in January - February. He experienced that original Boroli Barilius barila seeds mostly do not survive for long in farm ponds. Other species belonging to genus Barilius grew upto 3.0 inch (250-300 pieces / kg at harvest) in his ponds in two months from stocking, 35-40 kg obtained in all, which he sold in local markets @ Rs 120 - 125 per 250 gm.

Mr Barman aims to widen his carp seed production facilities and set up mini fish feed mill with Government support. He is innovative, enthusiastic and hard-working, seeks to gain new skills and ideas, learnt techniques and obtained necessary advice from reputed elderly fish farmer of north Bengal Mr Kripan Sarkar.

Noteworthy instances, success stories and journeys of such young aqua-entrepreneurs like Lakshman Barman in far-away places and remote villages will definitely inspire other budding fish farmers and fish breeders in WB to grow; will be a lesson for them.

Uni-President

AQUACULTURE PROBIOTICS EXPERT

Nu Ri

NET 200 g **BSL**

Probiotics for water treatment

1. WATER QUALITY CONDITIONING

Best choice of *Bacillus* spp. that rapidly decompose uneaten feed, feces and other organic substances in pond water, keeps water quality optimal

2. HIGH ACTIVITY OF SPORES

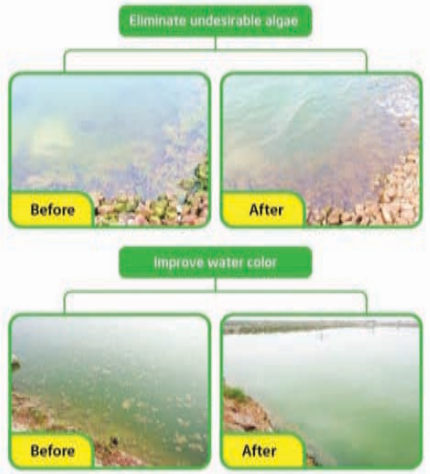
No cultivation is needed. Easily adapt to the changes of surroundings and grow fast in freshwater or seawater culture farming, even under low oxygen environment

3. DECREASE AMMONIA CONTENT

Prevent the accumulation of toxic substances such as NH_3, NO_2, etc.

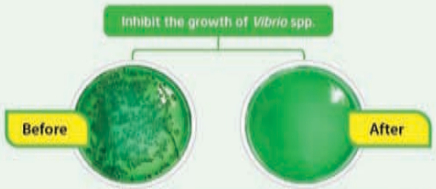
4. IMPROVE WATER COLOR

Improve water color regulate the algae and bacteria balance in water, turning your pond from green to clear



5. ESTABLISH BALANCED POND BACTERIA SYSTEM

Compete nutrition with vibrio and inhibit them to grow. Provide nutrition for probiotics in the pond, to establish a well-balanced farming system.



6. INCREASE AQUACULTURE PRODUCTION

Good quality of water prevents fish/prawn infections, making high profit of production

* COMPOSITION:

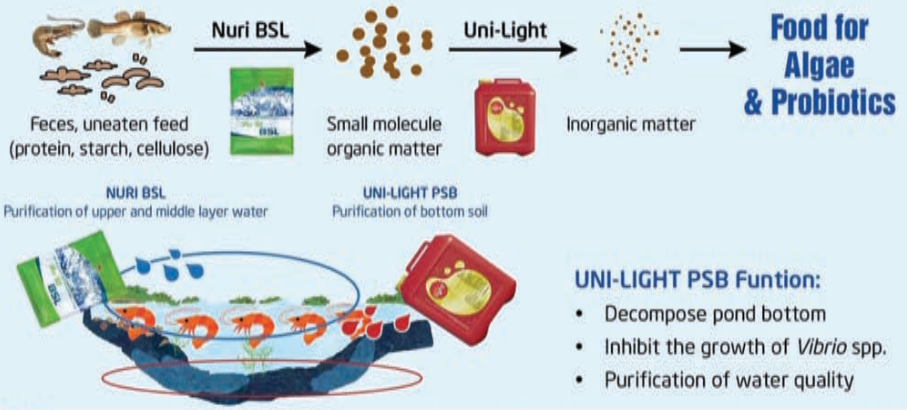
Bacillus spp. > 1x 10^{11} cfu/kg	15%
(Bacillus subtilis, Bacillus amyloliquefaciens, Bacillus licheniformis)	
Carrier (rice bran, corn gluten)	75%
Moisture	10%

* STORAGE:

Keep at dry, well-ventilated condition. Avoid direct sunlight exposure and use as soon as possible once opened for best quality.

* DIRECTION OF USE:

No cultivation is needed. Apply Nuri BSL with water-soluble bag near to the working water wheel or pour into the pond evenly. Recommend apply Uni-Light PSB together with Nuri-BSL on sunny day to achieve a clear pond more efficiently.



UNI-LIGHT PSB Funtion:

- Decompose pond bottom
- Inhibit the growth of *Vibrio* spp.
- Purification of water quality

BSL Dosage:

/10,000 m³ Quantity	10 - 30 pl/m² tiger prawn or < 80 pl/m² Vannamei	For >30 pl/m² tiger prawn or > 80 pl/m² Vannamei	For > 150 pl/m² Vannamei
7 days before stocking	800 g - 1,000 g	1,200 - 1,500 g	1,200 - 1,500 g
Day of stocking	300 g - 500 g	800 g - 1,000 g	800 g - 1,000 g
Every 7 - 10 days after stocking	300 g - 500 g	800 g - 1,000 g	3 - 5 days / use 1,000g - 2,000g

****Dosages can be adjusted according to the water conditions and practices.*

UNI-PRESIDENT VIETNAM CO., LTD

No. 16-18-20, DT 743 Road, Song Than II Ind Zone, Di An Ward, Di An City, Binh Duong Province, Vietnam.

aquafeed@upvn.com.vn

www.uni-president.com.vn

Farmers urge Kerala government to regulate aquaculture sector

'Ensure farmers receive remunerative prices and fair practices are followed'

Kochi: Aqua farmers have appealed to the State government to intervene to regulate fish farming in the State in such a way that the farmers receive remunerative prices for the produce and to ensure that fair practices are followed.

According to the Kerala Fish Farmers' Association, there are around 12,000 registered fish farmers in the State and also others who take up fish farming without licence. The activity, like dairying, had become a means of livelihood for such people, said a fish farmer and former president of the association Mr Reji Poothara.

He said several farmers used slaughterhouse and poultry waste as feed for the fish while others depended only on fish feed available in the market. There were differences in the cost of production in the two practices, said Mr Poothara, who has been cultivating genetically improved farmed Tilapia as well as other fishes.

K.K. Vijayan, the former director of the ICAR-Central Institute of Brackishwater Aquaculture in Chennai, said Kerala had great potential for aquaculture, but it was not being utilised. He said the State needed commercial grade hatcheries to produce quality seeds of commercially important fishes as well as commercial feed mills to produce quality formulated feeds. It would encourage more farmers and entrepreneurs to come into the field because aquaculture was a great opportunity to generate employment and income for people, he said, adding that public-private partnership in aquaculture was needed.

Dr Vijayan said aquaculture needed attention and hard work for positive results. The cultivation of fish not only generated job opportunities but also opened a window to food security. He said states such as Andhra Pradesh, Gujarat, West Bengal and Tamil Nadu were much ahead of Kerala in aquaculture, especially in shrimp production. The State must intervene in a serious manner to encourage and support aquaculture using its vast aquatic resources, he said. While the total aquaculture production in the country was over a million tonnes, Kerala's production was only around 50,000 tonnes, he said.

Thomas Abraham, an aqua farmer in Pathanamthitta district said, the availability of feed and fish seeds was a huge problem. He said farmers who used waste materials to feed fish were able to sell their produce at much lower prices than those cultivating fish using approved feed materials.

Bench forms Monitoring Committee to supervise the action taken by the authority near Pakkam

The Special Bench of the National Green Tribunal has directed the Coastal Aquaculture Authority (CAA), Chennai, to put an end to all illegal coastal aquaculture activities in its jurisdiction being carried out without registration or in violation of the Coastal Aquaculture Authority Act, 2005. The Bench noted that enforcement was "highly inadequate" at the moment and unregistered aquaculture activities were found in abundance.

The Bench directed the authority to initiate prosecution against the violators and assess compensation for past violations.

The directions came in a case related to illegal prawn culture aqua farm activities at Pakkam village in Tiruvallur district, near the Chitteri waterbody, which is a source of drinking water to Chennai. The waterbody is part of the Pazhaverkadu Bird Sanctuary and close to Pulicat Lake.

The Bench said there were large-scale violations as per the tribunal's findings and there was a need for strict enforcement by the statutory authorities that needs to be overseen by a monitoring committee "at least for some time". The Bench constituted a monitoring committee headed by member-secretary, National Coastal Zone Management Authority (NCZMA), a nominee of the director of NCSCM, TNCZMA, the CAA and Chief Wildlife Warden, Tamil Nadu, as members for six months. The Bench directed the committee chairman to call a meeting within two weeks, take stock of the situation, prepare an action plan and execute it within a reasonable time.

The Bench noted that as per CRZ notification, aquaculture activities in the Coastal Regulation Zone were prohibited but under the CAA Act, the same have been permitted beyond 200 metres from the High Tide Line in the CRZ area subject to registration. "Even permitted coastal aquaculture activity is subject to regulation as per CRZ Notification, 1991/2011/2019," the Bench said.

Further, the Bench said the CAA Act was not an exhaustive law and water pollution was still governed by the Water Act, wildlife protection was governed by the Wildlife Act and assessment of impact on coastal area was governed by the CRZ notifications.

"CAA Act provides for prohibiting such activities without registration to the extent permissible. Thus, no unregistered activity can continue. Prohibited activity under section 13(8) can also not continue. Even permitted activities, apart from registration require compliance of environmental norms under other statutes," the Bench said.

Aquaculture practices launched at Kochi airport's golf club

Normal or conventional pond culture practices will not be suitable here

Kochi airport Managing Director S Suhas along with MPEDA Chairman Dr K N Raghavan inaugurating the project by releasing fish seeds to golf club's water body.

KOCHI: As Part of business diversification, the Cochin International Airport Limited (CIAL) has introduced aquaculture practices in the water bodies at its golf club at Nedumbassery.The Marine Products Export Development Authority (MPEDA) and the Rajiv Gandhi Centre for Aquaculture (RGCA) have joined hands with CIAL for eco-friendly, sustainable cage farming in the water bodies.

CIAL Managing Director S Suhas said: "Aquaculture offers many environmental benefits, related to other forms of livestock farming. Over the last five years, the aquaculture industry has reduced its carbon footprint through gradual assimilation of new production systems that have reduced greenhouse gas emissions, reduced the use of freshwater per unit produced, improved feed management practices and adopted new farming practices". "As sustainability champions, CIAL strives for climate-friendly practices that generate sustainable environmental, social, and economic outcomes for the long term," he said. The CIAL Golf Club has seven water bodies of varying sizes totalling almost 16 acres. Ponds in the club are deep and big in size.

Normal or conventional pond culture practices will not be suitable here. In cage fish farming, there is no need to drain the water bodies and management of the waterbody enivironment is flexible with multiple production units. Easy and low-cost harvesting are also added advantages.

MPEDA and RGCA will provide testing for periodic disease diagnosis of fish and water quality analysis and seeds at a subsidised rate from their hatchery at Vallarpadom. The species recommended by MPEDA-RGCA for the pilot project are GIFT tilapia, seabass and pearl spot.

Suhas said the CIAL has successfully executed the idea of total sustainability management (TSM) in its golf course where treated water from the sewage treatment plant of the airport is used for water harvesting with the help of 12 artificial lakes.

FISHING IN CIAL WATERS

The CIAL Golf Club has 7 water bodies of varying sizes

Marine Products Export Development Authority and the Rajiv Gandhi Centre for Aquaculture have joined hands with CIAL for cage farming in the water bodies

Recommended species: GIFT tilapia, seabass & pearl spot.

International Health Care Ltd participates in NIPOLI EXPO at Ibadan-Nigeria

International Health Care team in NIPOLI EXPO, Ibadan-Nigeria

International Health Care Ltd (PVS Group) from India participated the Nigeria International Poultry and Livestock Expo (NIPOLI) during 17 to 19 May 2022 at Ibadan in Nigeria. After Covid-19, this is the company's first global participation and it was a platform that served as a connection between poultry, livestock and fishery industry. Mr Arun Pamulapati, Director and Dr Ajit Jadhav, General Manager represented the company and interacted with visitors. The Nigerian farmers, distributors, wholesalers etc visited the stall and interacted with the company people which were seeking for latest products, productive business partnership and many more. Company introduced its newly developed product with metabolite technology and explained to the visitors about its importance and vale addition benefits in poultry, livestock and aquaculture industry.

A note from the company said, PVS Group, is one of the leading manufacturers and exporter of animal

health care products for more than 28 years. The group has its own dedicated manufacturing units in India (Vijayawada) that include drug formulations facility, feed supplements and disinfectants production set-up. PVS values Product Quality, Service and Transparency in business, and began operations with same principles and has so far lived up to the expectations of its customers globally through the group's motto 'Try and Trust'.

Odisha signs MoU to promote Bhetki fish

Under the pact, Rajiv Gandhi Centre for Aquaculture will transfer technical know-how, plans and designs for the successful management of hatchery

The Odisha government has signed a memorandum of understanding (MoU) with the Rajiv Gandhi Centre for Aquaculture, the research and development arm of the Marine Products Export Development Authority in the ministry of commerce and industry, to set up a hatchery for the mass production of Bhetki fish seeds.

Bhetki is a much sought-after fish in the state after Hilsa and Rohu. While Hilsa is not affordable for the common man because of its high price, Rohu is cheaper. For Hilsa, Odisha still depends on the Bengal market.

Bhetki (Lates Calcarifer or sea bass) fish are found in coastal water, estuaries and lagoons.

"The fish is tasty. But its price per kg hovers around Rs 500 to Rs 600. We need to produce more Bhetki fish by involving farmers. The seeds produced in the hatchery in Gopalpur in Ganjam district will later be given to farmers for mass production of Bhetki. The MoU was signed in presence of the chief minister on Tuesday," said a senior official of the fishery and animal resources development.

Under the MoU, the Rajiv Gandhi Centre for Aquaculture will transfer technical know-how, plans, designs and other information for the successful management of the hatchery.

The centre will also scale up the technologies developed in the research institutes by joining hands with the Odisha government's scientists and disseminating the required knowledge for the production of the seeds. Later the seeds will be developed as fry and fingerlings.

"There is a demand for Bhetki in Odisha. The farmers will immensely benefit from the hatchery," said chief minister Naveen Patnaik.

Minister, fishery and animal resources development Ranedra Pratap Swain said: "We are taking a number of steps like involving women self-help groups (SHGs) to promote pisciculture in the state."

Officials maintained that the state government spends around Rs 100 crore per annum towards subsidy for farmers to take up new fish tanks for expansion of intensive inland and brackish water aquaculture.

"Through a liberal policy, the long-term lease of panchayat tanks are provided to women SHGs, and currently around 8,300 women SHGs are taking up inland aquaculture, under the flagship 'Mission Shakthi' programme of the state government. The policy for leasing water area in reservoirs for undertaking Cage Culture fisheries has also been a tremendous success," the officials said.

The state also signed an MoU with the BAIF Development Research Foundation for the recruitment of 1,500 artificial insemination technicians.

Odisha on Tuesday launched Fisheries and Animal Resource Mapping. Under this, all fishing and farming units in the state will be geotagged and mapped.

Soyabean output likely to be below govt estimates: SEA

Industry pegs the output at 10 million tonnes against 13.83 projected by the Centre

Mangaluru: The Solvent Extractors' Association (SEA) of India feels that the soyabean crop is likely to be lower at 10 million tonnes (mt) against the government's estimate of 13.83 mt.

Atul Chaturvedi, President, SEA, in his monthly letters to its members, said the Union Ministry of Agriculture and Farmers Welfare's third advance estimate for major crops had estimated the oilseeds output at 38.5 mt. It was at 35.95 mt during the last year.

Stating that these are good tidings, he hoped that oilseed production would continue growing in the coming years. According to the government estimate, the soyabean crop is at 13.83 mt, and the rape-mustard seed crop at 11.75 mt.

The trade estimate for soyabean, as announced by SOPA, is 11.9 mt, he said, adding: "But many industry players believe the soyabean crop is much lower at 10 mt as they do not see the pressure of market-arrivals even at the current high price of soyabean."

Crop diversification

Stressing the need for crop diversification, he said the MSP-driven wheat and rice production in Punjab and Haryana has assured a ready market and reasonable returns to the farmers. But this has created huge anomalies and demand-supply mismatch. Mountains of wheat and rice are challenging the country's storage infrastructure.

Urging the need to divert some land in Punjab from wheat/rice cycle to sunflower, maize in kharif season, and to rapeseed/mustard in rabi season, he said: "We have to ensure farmers are suitably incentivised by ensuring better returns and assured market. If we can convince farmers in these north Indian states; 'Yellow Revolution' can become a reality."

In this regard, SEA would establish model farms in two districts of Punjab during rabi season to show that crop diversification to rape-mustard seed can be more remunerative than wheat.

Imported inflation

On inflation, he said, India's high dependence on imported fuel and edible oil are the primary reason. No country can have fuel security when it depends on to the extent of 85 per cent of its need. Edible oil security is also seriously compromised, with 65 per cent dependence on imports.

Mentioning that there are no quick-fix solutions to combat imported inflation that has been fuelled by easy monetary policies and geo-political issues plaguing the world, he said high prices have resulted in demand destruction to some extent which should help in bringing some sanity back in the markets.

The message of the Prime Minister for working towards aatmanirbharta in fuel and edible oils is now being acted upon in all seriousness by the concerned ministries. The thrust on biofuels, more particularly ethanol, and implementation of National Mission on Oilseeds should go a long way in reducing India's dependence on the world, he said.

Storage control order

On implementing the storage control orders, he said it gives undue powers to officers tasked with its enforcement and results in avoidable harassment. "This is contrary to Prime Minister's stated vision of improving 'ease of doing business'. It beats our imagination why edible oils are targeted when almost 65 per cent of it is imported, which is exempt. We trust and hope this draconian law is withdrawn at the earliest," Chaturvedi said.

Castor seed

According to Chaturvedi, India produces about 1.8-2 mt of castor seed and exports nearly 700,000 tonnes of castor oil and about 150,000 tonnes of castor seed derivatives, meeting 90 per cent of the requirements of the world.

He said SEA Castor Seed and Oil Promotion Council has decided to develop the Indian Castor Seed Sustainability Standard (INCASS) for products based on Indian conditions and issue the Sustainability Certificate either by SEA or its affiliated body to the castor fraternity.

He said SEA Castor Seed and Oil Promotion Council has set up a special committee to work out modalities and implement the Castor Sustainability Standard within 3-6 months.

Rice bran

He said the Union Commerce Ministry's notification dated May 5, placing de-oiled rice bran exports under APEDA shocked SEA members processing rice bran. Over the last 50 years, SEA has taken a lot of pain and effort to promote exports of de-oiled rice bran ,helping increase the overall processing and production of rice bran oil.

"We fail to understand the need for shifting de-oiled rice bran from the purview of SEA to APEDA. The change will dilute the focus and may affect the overall processing of rice bran, production of rice bran oil, and exports of de-oiled rice bran," he said.

Gassen Plus

Bon Ammonia and obnoxious Gasses

Shrimp / Fish performs all their body functions and growth in water. Good quality water and proper D.O. levels determines the success or failure. Good quality water, optimum D.O. level is of prime importance for health and growth of Shrimp / Fish.

Irregular water exchange, excess and leftout feed, dead algae, fecal matter, increases the organic load at the pond bottom. Accumulation of such waste absorbs available oxygen, creating anaerobic condition which leads to pollution of pond bottom. Polluted pond bottom and unhealthy environmental conditions triggers the release of toxic gasses like Ammonia, H_2S, Methane, etc, The toxicity of Ammonia, Hydrogen Sulphide, Methane attributed mainly due to unionized form. As the concentration in water increases, ammonia excretion by aquatic organism diminishes and the level of ammonia in blood and in other tissues increases. Ammonia increases oxygen consumption by tissues, damage gills and reduces the ability of blood to transport oxygen, and increases the disease susceptibility. To eliminate / overcome the above problems 'GASSEN PLUS' Yucca Schidigera, it contains Steroidal"Saponin" which help to reduce ammonia and other noxious gasses such as H_2S, Methane, etc., Microbial enzyme "Urease' Production inhibited by Saponin which leads to an increases D.O. and reduction of BODand COD levels.

Bacterial strains such as Bacillus Subtilis, Nitrobactor, Nitrasomonas, rapidly converts ammonia into Nitrates, Nitrites and finally non-toxic Nitrogen. Hydrogen Sulphide converts into Sulphates, Sulphites and finally non-toxic Sulphur, Methane into Non-toxic carbon. This conversion reduces the obnoxious gasses in the pond bottom. Reduction of this gasses improve the D.O. level in the water and bottom.

COMPOSITION:
YUCCA SCHIDIGERA
ALOEVERA
BACILLUS SUBTILIS
BACILLUS POLYMIXA
BACILLUS LICHENIFORMIS
NITRASOMONAS
NITROBACTOR
STABILIZERS

DOSAGE : 1 Kg per Acre or consult your Aqua Technician For Specific Usage & Dosage

PRESENTATION: 500 gms &1 kg

DOCTOR'S VET-PHARMA PVT. LTD
cG.M.P. Certified an ISO 9001:2008 Company
Survey No. 263/1, 264/1, P.R. Palem (V), Kovur (M),SPSR Nellore Dist.- 524137. A.P. INDIA.
Tel. 08622 - 210902. Email: dvpl33@yahoo.com, www.doctorlifesciences.com

ANTIBIOTIC FREE,
STEROIDAL FREE.

Economic incentives drive the conversion of agriculture to aquaculture in the Indian Sundarbans: Livelihood and environmental implications of different aquaculture types

Economic incentives drive the conversion of agriculture to aquaculture in the Indian Sundarbans: Livelihood and environmental implications of different aquaculture types

Abstract
Expansion of aquaculture in the Sundarbans Biosphere Reserve (SBR) is irreversibly replacing agricultural land and the drivers of this change are disputed. Based on in-depth interviews with 67 aquaculture farmers, this paper characterizes major aquaculture types in the SBR, their impacts, and identifies drivers of conversion from agricultural land. Aquaculture types included *traditional*, *improved - traditional*, *modified - extensive,* and *semi-intensive* systems. Extensive capture of wild shrimp larvae is environmentally harmful but constitutes an important livelihood. Semi-intensive aquaculture of exotic shrimp (*Litopenaeus vannamei*) has much higher unit-area profitability than other types but involves greater financial risk. Profitability is the main driver for the transition from agriculture, but environmental factors such as lowered crop yields and cyclone impacts also contributed. Many conversions from agriculture to aquaculture are illegal according to the stakeholders. Existing legislation, if enforced, could halt the loss of agriculture, while the promotion of improved-traditional aquaculture could reduce the demand for wild seed.

introduction
Aquaculture is a rapidly expanding sector in the Sundarbans Biosphere Reserve (SBR), West Bengal, India, as in many other tropical coastal areas of the world. The state of West Bengal is the highest producer of tiger shrimp (*Penaeus monodon*) in India producing 50 000 tonnes from an area of 51 000 ha (Handbook on Fisheries Statistics 2018) of which the major portion comes from the transitional (i.e., inhabited area) zone of the Indian SBR. There is a dearth of data that demarcates the area under freshwater and brackish water aquaculture, nor different aquaculture styles. Chopra et al. (2009) reported that brackish water aquaculture constitutes the major portion of the total aquaculture area. Brackish water aquaculture in this region started expanding in 2001 (Hazra et al. 2010) and at present, there is a trend of transition from agriculture to aquaculture and especially to brackishwater aquaculture (Ghosal et al. 2019). The conversion of agricultural land in this region has been ongoing for a few decades, drawing the attention of both researchers and policymakers (Chopra et al. 2009; Sánchez-Triana et al. 2014; DasGupta et al. 2019). Remote sensing shows that the aquaculture area has increased 2–3% annually in the last two decades (DasGupta et al. 2019; Giri et al. 2021) of which 98% (average 821.9 ha year^{-1}) have originated from the conversion of agricultural land. Different reasons behind this proliferation of aquaculture and land-use conversion from agriculture have been reported in earlier studies, including higher profitability, high market demand, reduced agricultural productivity, and detrimental effects on agriculture production from natural hazards like cyclones (Chopra et al. 2009; Sánchez-Triana et al. 2014, 2018; Dubey et al. 2017; DasGupta et al. 2019). Increased soil salinization making the land unsuitable for agriculture has also pushed farmers to transition into brackish water aquaculture (DasGupta et al. 2019).

The emergence and rapid expansion of brackishwater aquaculture in Sundarbans threaten to cause different long-term consequences such as loss of biodiversity and socio-economic impacts (Chopra et al. 2009). A major portion of the brackish water aquaculture in Sundarbans depends on the wild post-larvae and broodstock of shrimps and fishes. For this purpose, many marginal villagers in Sundarbans, especially women, are dependent on income generated from the post-larvae collection of tiger shrimp (*P. monodon*). In these juvenile stages (seeds) they are either directly procured by the aquaculture farmers or supplied by seed sellers. The collection of shrimp seeds is common in India and Bangladesh and has been shown to result in large by-catch (Das et al. 2016). Santhakumar et al. (2005) estimated that around 400 different species are caught as bycatch, including 318 other prawns, 8 fishes, 60 crabs, 1 mollusk, and 13 unidentified. Aquaculture expansion in the delta has come at the cost of other land-use types such as agriculture, mudflats, and fringe mangroves (Chopra et al. 2009; Knowler et al. 2009; Philcox et al. 2010; Bhattacharya and Ninan 2011; Sánchez-Triana et al. 2014). The

socio-economic impact of brackish water aquaculture can be conspicuous when contributing to economic inequality relative to agriculture. The considerable higher returns (compared to agriculture) from aquaculture accumulates within a limited number of individuals (Chopra et al. 2009). Moreover, as aquaculture is less labor-intensive than agriculture, land conversion reduces employment opportunities for landless local people and successively reduces the scope of dissipating the profit inflow among the local community (Choudhury et al. 1994; Chopra et al. 2009). Apart from this, the risk of seepage or leaching of saltwater from the brackish water aquaculture farms into the adjacent agriculture farms often results in social conflicts (Chopra et al. 2009).

As the diverse types of aquaculture practices in Sundarbans have different economic, social, and environmental impacts, there is an urgency for increasing our understanding of the present land-use transformation, environmental and social performance of different aquaculture types, farmers perceptions, and the key drivers behind the transition. Therefore, the main aims of this study were to: (1) characterize the different types of aquacultures currently found in SBR, including their practices, labor demands, and profitability, and (2) identify the different drivers behind the conversion of agricultural lands to aquaculture.

Materials and methods

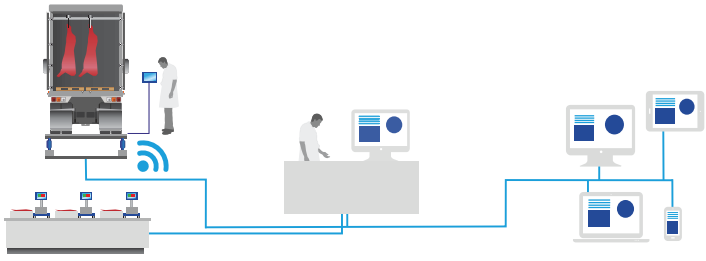
Study area: Sundarbans Biosphere Reserve

Indian Sundarbans Biosphere Reserve (SBR) (21° 32′ N–22° 40′ N and 88° 05′ N–89° 51′ E), a unique mangrove forest with high population density is located in the southern end of the state of West Bengal (Fig. 1). It comprises an area of 9630 km^2 including core, buffer, and transition zones (Ghosh 2015). The core of the reserve forest area is fully protected and no human activities are allowed except research with the prior permission of the forest department. In the buffer zone, fishing and honey collection are allowed with permits from the forest department. The core and buffer area together constitute the Reserve Forest part of the SBR, covering an area of 4263 km^2. Out of the total Reserve Forest area, core and buffer areas cover 1700 km^2 and 2563 km^2, respectively. The Reserve Forest area includes the Sundarbans Tiger Reserve (STR), which covers an area of 2585 km^2. In the transition zone only (an area of 5367 km^2, adjacent to the uninhabited core zone with a contiguous mangrove forest) there is human habitation of around 4.43 million people (as per the 2011 census) (Samanta 2018) and all kinds of human activities are allowed in this zone. The SBR encompasses 19 of the 51 administrative blocks of the two coastal districts of North and South 24-Parganas. The transitional zone of the SBR has an estimated aquaculture area of about 519.13 km^2 (Thakur et al. 2021). The SBR region was declared as a National Park in 1984, and in 1987 it was inscribed to the list of UNESCO World Heritage Sites. The SBR has 102 low-lying islands of which 54 are inhabited by humans. The islands of the entire Sundarbans including both India and Bangladesh are formed by the intricate network of tributaries and distributaries of the river Ganges, Brahmaputra, and Meghna (Rahman et al. 2020). The Indian part is demarcated by river Ichamati-Kalindi-Raimongal on the east, by the river Hugli on the west, by Dampier-Hodges line on the north, and the Bay of Bengal on the south.

Sundarbans has a rich and diverse flora and fauna and has the highest natural production of fish, prawns, and shrimps of West Bengal. Around 172 species of fishes, 20 species of prawns and shrimps, and 44 species of crabs are found in Sundarbans which supports the aquaculture and fisheries activity in the SBR (Chand et al. 2012). Historically Sundarbans was reclaimed from pristine mangrove forest for agriculture and settlement. In recent times, the area consists of different types of land use classes like mangrove forests, agricultural lands, aquaculture farms, tidal rivers and creeks, rural and semi-urban settlements, and mudflats (DasGupta et al. 2019). The region is physically isolated from the mainland leading to a high dependency of the population on natural resources. Primarily, the livelihood of this rural population was agriculture followed by artisanal fishing, and forest goods collection (DasGupta et al. 2019).

The climate across the SBR is monsoonal, predominated by the southwest monsoonal wind. Usually, the middle of June is considered as the onset of the southwest monsoon that continues up to the first or second week of October with the highest rainfall during August. The average annual rainfall in Sundarbans has been reported as 1625 mm sometimes raises to 2000 mm in the heavy rainfall year and may also drop to 1300 mm in the low rainfall years (Chand et al. 2012). Despite the numerous rivulets and creeks, the people of this region suffer from a paucity of freshwater. Groundwater is only available beyond the depth of 250 m (CGWB 2006; Sinha Ray 2010; Hazra et al. 2015). The river waters are saline in the SBR and often contaminate the groundwater. This scarcity of freshwater also hinders agricultural activity due to less availability of irrigation waters and the agriculture in the region is mostly dependent on monsoon water (Hazra et al. 2015). However, in the last few decades, a delayed onset and recession of monsoon have been observed (Chand et al. 2012) creating additional challenges for agriculture. Furthermore, there is evidence that the region is also experiencing temperature increases (Hazra et al. 2010), more frequent extreme climatic events such as cyclones

Collect+ : Enhance Production with Data Gain Certainty in Manufacturing



Collect+
- Receive weighing data from all installed measuring devices in the goods entry or production zone
- Online results are refreshed every five seconds

Publish and Share
- View results on any PC or mobile device
- Tailor your dashboard according to your needs
- Share the dashboard with colleagues

Visualize
- Production output
- Production forecasts
- Worker efficiency
- Quality data
- Yield analysis

Monitor Product Quality

Track Production Efficiency

Remote Monitoring Display

Collect and Store Data Easily

Write to us
at sales.sales@mt.com or
Call Toll Free at 1800 22 8884 / 1800 10 28460
or visit us at www.mt.com

METTLER TOLEDO

www.mt.com/collectplus-mp

and floods (Singh 2007), rapid sea-level rise (Pethick and Orford 2013), saline water intrusion (Hazra et al. 2015), and habitat loss due to high coastal erosion (Ghosh et al. 2014).

Survey framework and data collection

This study was based on interviews with 67 aquaculture farmers in the SBR (covering all the 19 community development blocks). Given the inability of physical fieldwork due to the COVID 19 pandemic, interviews for the present study were carried out over the telephone. Farmers' contacts were collected from the manager-technical (aquaculture), IFB Agro Industries Limited, and an official of Marine Products Export Development Authority (MPEDA), Govt. of India. Participants were sampled using the purposive sampling technique to target aquaculture farmers (farm owners who were actively involved with the aquaculture farming) in different areas of the delta and were not stratified by aquaculture type. All respondents had aquaculture as their primary livelihood (main livelihood that contributes to the lion share of the income). During the interview, very short and focused questions (Table 1) were asked to the respondents related to their aquaculture practices, type of land use transformed to aquaculture, driving forces behind the transformation, and profitability. All the interviews were recorded with the prior permission of the respondents.

Insect farming under fire as new fish welfare benchmark is launched

An aquaculture standard that includes a ban on insect-based feed ingredients - for environmental and ethical concerns - has been heralded as the most robust fish welfare standard currently available to the aquaculture sector.

Aquatic Life Institute (ALI) has today launched a benchmark tool to evaluate six of the most well-known, global aquaculture certification schemes and their effectiveness with respect to aquatic animal welfare standards.

These certifiers included Global Animal Partnership, RSPCA assured, Naturland, Friend of the Sea, Global GAP and Best Aquaculture Practices.

The report recognises the newly released Global Animal Partnership Atlantic salmon welfare standard "as the most welfare-comprehensive standard to date". This standard incorporates the latest science-based interventions to improve welfare for farmed salmon.

To meet the standard, facilities must include enrichments at all life stages, adhere to strict stocking density limits, monitor water quality on a daily basis, and comply with adequate stunning and slaughter requirements. It also includes a novel ban on insects in farmed fish feed, despite the fact that fish such as salmon naturally eat insects throughout their juvenile, freshwater life stage.

Black soldier fly larvae
The Aquatic Animal Alliance is concerned that mass production of these insects could lead to novel zoonoses

According to ALI, insect farming is "a potentially significant industry of concern due to the unknown animal welfare consequences and negative environmental impacts throughout the production cycle".

"We are concerned about insect agriculture for many reasons, one of such is that the link between agricultural intensification and novel zoonoses is well established in the literature. All factory farming operations are in a constant struggle with disease control. The hyper-dense environment of thousands (or in this case, trillions) of animals in close proximity is a perfect breeding ground for pathogens. The story of novel zoonoses increasing the costs of factory farming is well-known: densely populated stock develops infections, blanket treatments are applied which externalises the true cost of the treatment, as antimicrobial resistance (AMR) decreases the efficacy of the treatment each time it is used. As time wears on that externalised cost is paid for in stock loss as the antimicrobials fail to return results. From AHPND in shrimp, to sea lice in salmon, to porcine nematodes, virtually every farming industry is limited by novel zoonoses with AMR," Catalina Lopez, director of the Aquatic Animal Alliance, explained to The Fish Site.

The Aquatic Animal Alliance is concerned that mass production of these insects could lead to novel zoonoses

"There are also precautionary concerns in terms of welfare of the insects farmed, as there is not much scientific evidence regarding welfare considerations in these operations. Also, the environmental impact is not known for this intensive type of production, as escapes and interaction with wildlife is inevitable, and the effects of those interactions are unknown," she added.

"The inevitability of industry-limiting diseases, as well as the tremendous suffering diseases caused in agricultural facilities, means we are extremely cautious to recommend new factory farming operations where commercially viable plant-based alternatives exist," Lopez concluded.

The rationale behind the tool

The new tool has been developed by ALI to try to bring fish welfare to the fore in aquaculture certification standards.

"Certifications are widely used by the aquaculture industry in order to verify the practices carried out on farms. Unfortunately, until very recently, most

Contd on Page 30

Udaya Ram Jothy passes away

Chennai: Mr Udaya Ram Jothy, Promoter and Managing Director of A.A. Biotech Pvt Ltd passed away here on 30 June 2022 due to cardiac arrest. He was 62 years. He left behind his wife Ms Vrinda Udaya and son Mr Sanjay Udaya.

Udaya Ram Jothy did his B.Sc with biochemistry from Coimbatore and M.Sc with mariculture from Kochi.

Udaya Ram established A.A. Biotech Pvt Ltd in 2004 at Chennai, India primarily to meet the essential requirements of aquaculture healthcare sector. Since then it has expanded its range of portfolio and now offers in bulk, a range of innovative products, solutions and services. A.A. Biotech's strength in this area has enabled it to formulate and provide specific range of biotech technology products that achieves these objectives.

Udaya Ram Jothy

Udaya Ram Jothy receiving bouquet from Aqua International editor M.A. Nazeer during the inauguration of India International Aquaculture Expo 2022 at Chennai on April 7, 2022

Udaya Ram was the President of Society of Aquaculture Professionals (SAP) during the period 2012 to 2014.

Ms Vrinda Udaya talking to Aqua International Editor said, Udaya Ram is like the God to me and his departure is a great loss to me and to my family. Udaya was very kind hearted and soft spoken person. He used to treat every one with respect. He was very simple, silent and matured person. He had taken care of me and the son very well. He never spoke much, but used to listen more. His blood group was B positive and he was always a positive person. Its very painful for me that he is no more. I used to call him "Daya" as he was a kind hearted person to me and to our family. He had all good habits in his life.
Ms Vrinda Udaya is a Director in AA Biotech and she has been participating in the business activities. She wants to continue the business Udaya Ram established and she wants to fulfil his objectives.

Udaya Ram Jothy and his wife Vrinda Udaya during an occasion.

From left: Udaya Ram's wife Ms Vrinda Udaya, Udaya Ram Jothy, Sanjay Udaya (son) and Ms Padmaja (daughter-in-law)

Contn from Page 28:

certification labels did not include meaningful animal welfare interventions, and focused only on aspects such as environmental impact or food safety, and excluded individual animal welfare considerations.
However, consumers are increasingly seeking transparency from the aquaculture industry, as many instances of poor animal welfare conditions have been uncovered on farms around the world, including farms certified by well-known schemes... Therefore, the implementation of meaningful and accountable animal welfare interventions is imperative and will result in benefits for animals, the environment, and public health alike," ALI argues in a press release.
As a result, the organisation says that it has engaged with certification schemes for over two years, to ensure that animal welfare is prioritised.
The areas of evaluation include environmental enrichment, space requirements and stocking density, stunning and slaughter, feeding practices and water quality.
"This benchmark will prove to be a valuable tool to any company in the food sector during their seafood purchasing decision-making process. It will support them in making more informed choices about certified products entering their supply chain, and allow the public to be better informed about practices associated with seafood production. The tool will also help certification schemes that are lagging behind in aquatic animal welfare, by shedding light on improvements that will allow them to stay relevant," stated Lopez, in a press release.
ALI plans to update the benchmark annually, and the next editions will compare more certification schemes and measure additional areas of concern.

My feelings: *Subrato Ghosh*

"I am extremely happy to receive this recognition 'Best Aquaculture News Contributor Award 2022'. I am a grass-root level extension worker, love science communication in my subject; wish to learn more from elderly progressive fish farmers, document their ideas, practice and ITK, keep frequent contact with them on-field. I often compose News-based descriptive write-ups for Aqua International (AI) magazine genuinely, passionately and voluntarily in quick time after participating in live Webinar/Seminar attentively; do not see replays or recordings. While doing this, I learn and enrich myself with knowledge and try to present the points of discussion, opinion and advice of Resource Persons/Speakers on newer technologies and concepts in different facets of fishery and aquaculture to readers (UG/PG students in Fishery, aqua-entrepreneurs, progressive fish breeders, reputed fish farmers, Government officers, etc) of AI and aware them, who may not have participated in the programmes. In February 2022 it was my 130th publication (articles and News) in AI since June 2010. Everytime Sri M. A. Nazeer Sir kept faith upon me and published my contributions, have been fulfilling my desires as a writer; it encouraged me, provided a platform to write more, sharpen my writing skills. I whole-heartedly try to keep up the standard of this

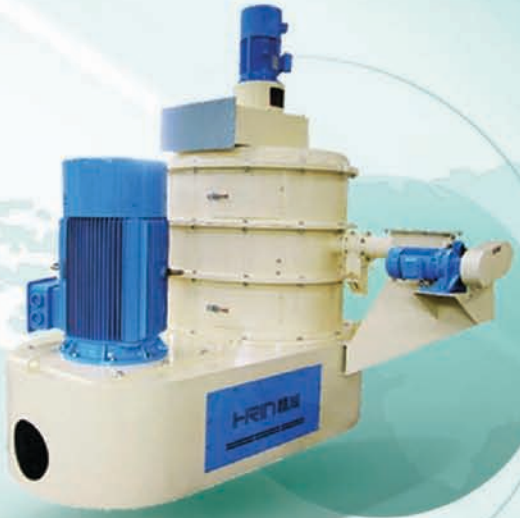
Subrato Ghosh, Fishery Extension Officer, Dept of Fisheries, Govt. of West Bengal, Kolkata receiving "Best Aquaculture News Contributor Award 2022" from M.A. Nazeer, Editor, Aqua International at NRS Publications office, Hyderabad, as he could not attend the awards function at Chennai held on April 6.

magazine, aim to provide error-free information to readers in general which may prove useful for them. I neither ask for money nor reward for my contributions to AI and spreading science. It is the greatness of Nazeer Sir that he has realized my earnest efforts and decided to appreciate and honour me once again after October 2017.

Today, on this auspicious occasion for me, in addition to Nazeer Sir, I would like to uphold the greatness of Dr S. Ayyappan Sir and his influence upon me. Revered Dr Ayyappan, who needs no introduction, has been conferred with Padma Shri Award this year. Moments I witnessed, viz., Sir extending cup of tea from podium to his teacher Late Prof. H. P. C. Shetty sitting in 1st row of audience in a Seminar at CIFRI; taking Award as Hony. Fellow of IFSI from Prof. S. Z. Qasim on 27/4/2002; pin-drop silence during Lecture on Indian Fisheries at Zoological Society, Kolkata; working in busy manner for preparations before Inauguration of 7th IFF at Bangalore on 8/11/2005 and in Seminar at CIFA on 7/6/2008, have remain etched in my mind. I saw photos of Sir explaining a point to Late Dr A. P. J. Abdul Kalam; walking barefoot over completely muddy village road in Bali island, Gosaba, WB; standing barefoot as seen in photo (as only person amongst other eminent persons) at Narendrapur RK Mission Ashram, WB.

Working at CIFA, I came to know more about Sir who used to be on pond site in early morning with researchers for sampling, I saw supporting staffs expressing 'Pranam' to Sir and Sir (as former Director) talking with them with smiling face. Even being unknown and non-registered, Sir told me to sit in front row in a Session of International Symposium on 4/12/2001 at C. V. Kulkarni Auditorium, CIFE, gave me Souvenir Book, saying: 'It will help you'. Sir sent hand-written inland letter on 8/3/2003 to me at my Department just before my MSc exam with words of inspiration. Such down-to-earth humbleness, care and hard-working attitude I observed in Sir; I remember my very small but memorable moments and short conversations with Sir more than once at CIFA, at 6th IFF at CIFE on 18/12/2002, at IoE(I) Seminar, Kolkata on 3/9/2004 (I am not boasting nor expressing pride). Undoubtedly it elevated my sentiments, inspired me to put more focus and do more good work sincerely, with patience, endurance and concentration. On this memorable day of receiving the Award, I once again express my gratitude to Nazeer sir, Ayyappan sir, P. Keshavanath sir, whose blessings and good wishes have helped me to grow and move forward".

Professional Feed Machinery Manufacturer



Hengrun SWFL Series Vertical Pulverizer

Vertical shaft with no-screen grinding, Bearing no maintenance. The production is uniform and the fineness is adjustable (Range from 40~200 mesh.)

Hengrun HRYTZ Series Vacuum Sprayer

Totally enclosed spraying space, Precision & Efficient spraying proportion widely ranged from 2%-30%.

Recirculatory Aquaculture System (RAS): *Way forward to Intensive and Sustainable Aquaculture Production*

Email: dettynebudevi@gmail.com

Detty Nebu., Monica K.S., Dr Rakesh K. and Dr Ganapathi Naik M
Department of Aquaculture,
College of Fisheries, Mangaluru, India.

Highlight Points

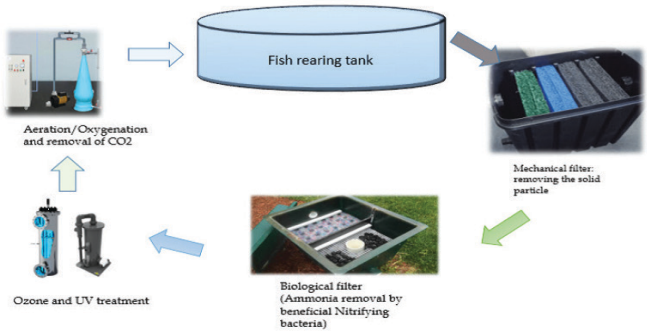
Recirculatory aquaculture system is a high-density culture technique by using limited resources. In this system, water is recycled and reused after proper filtration and is done in indoor/outdoor tanks in a controlled environment. With RAS the fish production can be increased upto 30-50 folds compared to conventional farming methods. Due to the lack of expertise and high capital investment this technology has yet to attain commercial scale adoption.

1. Introduction:

Aquaculture continues to grow faster than any other major food producing sector in the world with an average annual growth rate of 5.3% per year during the period 2001-2018 (FAO,2020). It is contributing to food security, livelihoods, foreign exchange and biodiversity conservation. However, further development of aquaculture is constrained mainly by the space and availability of suitable sites, scarcity of water supply and worsening water quality due to external source or self-pollution, climate change, environmental issues raised by poorly managed aquaculture systems, outbreak of diseases, lack of technological upgradation etc. Sustainable aquaculture makes environmentally sound use of resources. It emphasizes mainly on production, technology, environmental compatibility and profitability. Recirculatory Aquaculture System is a robust technology which allows high production using limited resources (land & water), ensures effluent management and thus reduces environmental impacts and provides biosecurity to some extent.

2. Recirculatory Aquaculture System (RAS):

Recirculatory aquaculture is a technology for rearing aquatic organisms by reusing the water in the production system. In this, water is recycled and reused after mechanical and biological filtration. This method is used for high-density culture of various species of fish and shell fishes by utilizing minimum land area and water. The recirculatory aquaculture farming is done in indoor/outdoor tanks in a controlled environment. Only new water is added to the tanks to compensate for splash out, evaporation lossand to flush out waste materials. The reconditioned water circulates throughout the system and daily water replacement is limited to 10%. The management of recirculating systems relies heavily on the quantity and quality of feed and the type of filtration. Filtration is to remove metabolic wastes, excess nutrients and solids from the water and provide good water quality for the aquatic organisms.



3. Components of RAS System

3.1 Fish Tank: Sizing of fish tanks is based upon the stocking density of fish. Circular tanks dominate the RAS due to their intrinsic structural and hydrodynamic properties. The circular tanks with a sloping bottom provide consistent water quality and are ideal for culturing. A circular tank with a drain at the center is good in solids removal because even a small circulation will tend to accumulate solids in the center.

3.2 Mechanical/ Physical Filtration:

Settable solids are easy to remove and should be removed by passing through sedimentation tanks and mechanical filter. Mechanical filters are primarily designed to remove suspended solids present in the water. It functions to filter out relatively large coarse impurities such as fish fecal matter, mucus, leftover feed, etc. Outlet water is commonly filtered in RAS using a micro-screen with a mesh size of 40 to 100 microns, a sand filter or particle filters. Another common method is to use a mechanical drum filter, in which running water is passed through a rotating drum screen where solids become trapped and can be back flushed out of the filter on a regular basis.

3.2.1 Foam Fractionator / Protein skimmer:

Foam fractionator is mainly used to remove organic/ biological waste present in the water. Some suspended matters that do not settle to the bottom but persist in the water column can obstruct the gill function and limit fish growth. These fine solids raise the oxygen demand in the system and also causes gill irritation. Such materials can be removed with a foam fractionator, it also eliminates the foaming agents that can build up in systems with frequent water reuse.

3.3 Biological Filtration:

The RAS relies heavily on biological filtration. As the name denotes it is a living filter composed of media upon which bacteria attach and grow. In its most basic form, a biofilter is a barrel or box filled with suitable media. A biofilter media must have a large surface area for bacterial attachment as well as a large pore space for proper water flow without any clogging. As a result of natural decomposition, the heterotrophic bacteria oxidize organic matter (fish excreta, uneaten feed) into carbon dioxide, ammonia, and sludge. Nitrogen in the form of free ammoniais hazardous to fish, thus it must be converted to harmless nitrate. The biofilter is the site where beneficial nitrifying bacteria remove all the wastes. The efficiency of biofiltration is mostly determined by the system's water temperature and pH level. For the optimum condition of nitrification process,water temperatures should be maintained within 10 to 35 °C (most favorable around 30 °C) and pH between 7 and 8 (Nilavet *al.*, 2020).

Nitrification process:

NH_4 (ammonium) + 1.5 O_2 → NO_2 (nitrite) + H_2O + 2H^+ + 2e

NO_2 (nitrite) + 0.5 O_2 → NO_3 (nitrate) + e

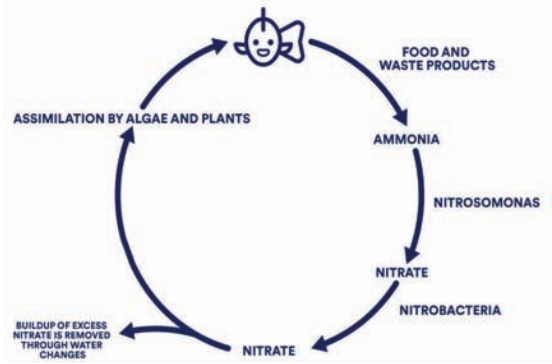
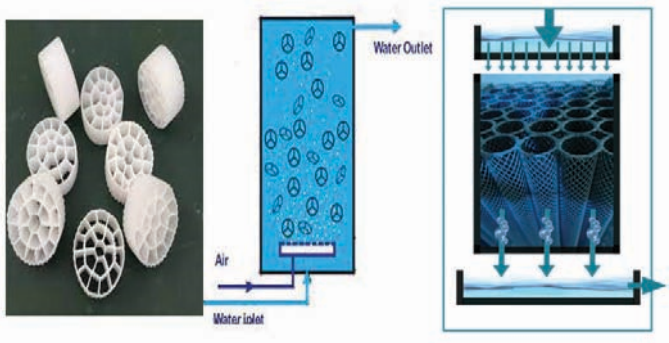


Fig: Nitrogen cycle

Biofilters are typically constructed using plastic media giving a high surface area per m³. The bacteria will spread out in a thin layer throughout the media covering a large surface area. The purpose of a well-designed biofilter is to maximise surface area per m³ while avoiding clogging with organic materials while in use. Biofilters, either fixed bed or moving bed, are often employed in recirculating systems.



3.4 Disinfection:

Disinfection is done to reduce the microbial load present in the water. The UV and ozone sterilization is commonly employed in RAS. TheUV-C at a wavelength of 254nm denatures the genetic material (DNA/RNA) of the micro-organisms and prevent its further replication. Ozone treatment is comparatively costlier than UV and its storage is difficult and dangerous. So ozone is generated on site in the ozone reactor and used immediately.

3.5 Aeration:

Oxygen is one of the most limiting factors in intensive aquaculture systems. Addition of oxygen in its pure form or as atmospheric air is essential for the survival of fish (respiration), for the optimum functioning of biofilter, for the oxidation of organic matter, to maintain optimum BOD etc. Low oxygen condition is stressful for the fishes and it will become more prone to diseases. Low DO negatively affects the growth rate of organisms, FCR and overall production. In RAS, pure oxygen injection systems, oxygen generators or oxygen diffusion systems are commonly used.

3.6 Water quality management:

The very high stocking densities and increased nutrient load in the RAS demands a regular management of water quality

PARAMETERS	ACCEPTABLE CONCENTRATION
DO	>5 mg/l
PH	6.5-8.5
TEMPERATURE	>20 °C for warm water species, 15-20 °C for cool
COD	waterspecies
TSS	20–30 mg/l
NITRITE (NO_2)	<80 mg/l
NITRATE (NO_3)	<0.02 mg/l
TAN	20-100 mg/l
ALKALINITY	0-0.2 mg/l
HARDNESS	80-140 mg/l
	140-300 mg/l

(Source: Bhatnagar et al., 2013)

Table 1: Water quality standards for fish production in RAS

parameters, otherwise they create an ideal condition for the pathogens to multiply. The production secret of any successful aquaculture systems is the good water quality, which it provides an optimal growth condition for the cultured organism. The most critical parameters that needed to monitor on a constant basis are temperature, DO, pH and NH3. For monitoring theseeither we can make use of manual monitors (chemical analysis, electronic probes) or automated monitoring systems.

4. Species suitable for RAS:

Asianseabass(*Latescalcarifer*),Cobia(*Rachycentroncanadum*), Pompano (*Trichinotus*spp), Grouper (*Epinephelus*spp), Pearl spot (*Etroplussuratensis*), Rainbow trout (*Oncorhynchus mykiss*), Nile tilapia (*Oreochromis niloticus*), GIFT tilapiaetc

5. Advantages of RAS

- Recirculating Aquaculture System reuses the water after undergoing the proper treatment and thereby reducing the water usage.
- RAS provides intensive fish farming compatible with environmental sustainability.
- It is an appropriate system that gives minimal effluent discharge with improved effluent quality so that it reduces ecological impact of effluent load and nutrient pollution.
- Judicial use of land and water.
- Flexible site selection.
- Enable secure production of non-endemic species (biosecurity).
- Consistent product quality due to a controlled environmental condition.
- Easy harvesting.
- Enable production of a broad range of species irrespective of temperature requirements.
- Feed management is considerably enhanced in RAS, more frequent feedings (several times per day) shall result in better growth rates and thus improved feed conversion ratio.
- Reduction of direct operational costs associated with feed, predator control and parasites and it potentially eliminates release of parasites to recipient waters.

6. Challenges

- Lack of experienced technically sound experts to carry out RAS culture.
- Constant uninterrupted power supply is required.
- Capital cost of starting a recirculating aquaculture system is high as compared to other conventional aquaculture systems.
- High operational cost.
- Species specific feed with high content of protein, essential minerals and vitamins are required.
- Inferior design and poor management strategies result in disease outbreaks.

7. Conclusion:

Recirculatory aquaculture system is a high-density culture technique by utilizing minimum land area and water. With RAS the fish production can be increased upto 30-50 folds compared to conventional farming methods. Due to the lack of expertise, significant capital investment and high operational costs, this technology has yet to attain commercial scale adoption. To generate interest among investors, efforts are required to minimize the cost of production by adopting new advancement in RAS, integrated RAS culture & alternate energy source.

References can be provided on request.

Biopesticide: an Ecofriendly Approach to the Aquaculture Practice

Suman Karmakar, Susmita Jana, Sushree Akankshya Das, Bhagchand Chhaba and Gora Shiva Prasad

Department of Aquatic Environment Management, Faculty of Fishery Sciences, West Bengal University of Animal and Fishery Sciences, 5 - Budherhat Road, Panchsayar, Kolkata, India.

Email: karmakarsuman204@gmail.com

Biopesticide is one type of eco-friendly pesticide which is mainly derived from natural material such as animals, plants and microbes. Nematodes, plants (e.g. Chrysanthemum, Azadiracthaindica), microbes (e.g. Bacillus thuringiensis, Tricoderma, Nucleopolyhedrosis virus) which are the parental material of biopesticides.

Three major classes of biopesticides

- Microbial Biopesticides
- Plant incorporated Biopesticides

- Biochemical Biopesticides

Table 1: summarized 3 types of biopesticides.

Microbial biopesticides	Plant incorporated biopesticides	Bio-chemical biopesticides
Products which consist of microorganisms as active ingredients. Mainly utilized fungi, bacteria and virus. Ex. Bacillus thurinngiensis	Here, genes inserted into the plant tissue and pesticides produce inside its own. Ex. Bt canola, Bt cotton, Bt potato etc.	Naturally occurring substance that control pests by non-toxic mechanisms. Ex. Azadiractin from Neem tree.

As a biopesticide extraction of Neemazadiractin is one of the most versatile and well known which contains at least 35 biologically active compounds such as antiviral, antibacterial, antifungal and insecticidal properties (Murussiet al., 2015).

Earlier to remove the predatory fish from aquaculture pond different types of synthetic piscicides were used. These piscicides have long term persistency in the water and also contaminate the aquatic environment. Therefore in the present situation, biopesticides are replaced with those harmful synthetic pesticides (Saravanaet al., 2010). Biopesticides are gained much more attention due to its non-persistency and low bioavailability in the environment.

Azadiractin has been successfully used in aquaculture to control the predator fish and different pest (Saravanaet al., 2010). Sometimes, it also prevents bacterial and viral infections in aquaculture farms. The dose of these biopesticides is most important because a high dose of biopesticides is slightly toxic towards the non-targeted organisms (Murussiet al., 2015 and Saravanaet al., 2010).

Significance

- Biopesticide is a systematic pesticide mainly acts upon target organism and closely related organisms (Saravanaet al., 2010).
- These are decomposed very quickly and bioavailability is very low.
- It is an integrated approach to ensure ecosystem and conserve biodiversity.
- It is replaced the synthetic pesticides and reduce the contamination in aquaculture farm and enhances the ecosystem based aquaculture for sustainability (Murussiet al., 2015).
- Biopesticides are also prevented bacterial, fungal and parasitic infections in fish culture (Kumar et al., 2013).
- Inhibit the growth of weeds.
- More effective than chemical pesticides in the long term.

Highlight Points

- In this article discussed about the use of bio-pesticides in aquaculture practice.
- Concept of bio-pesticide is an eco-friendly approach in agriculture as well as aquaculture practice because it is mainly made up of plant and animal materials.
- Farmers are benefited to use this pesticide because it increases the production silently and affordable cost.
- In future for sustainable production bio-pesticides are required in aquaculture sector.

Hindrances

- High levels of these substances are slightly toxic to the non-targeted organisms (Saravanaet al., 2010).
- Sometimes the speed of action of these pesticides is very low.
- Biopesticides are highly specific, mainly act upon the targeted species.

Future prospect and Conclusion

Biopesticides are eco-friendly to the environment. In the present situation, acceptances of these substances are increased among the farmer due to its low marketable value and environmental safety. Due to the use of biopesticides revolution occurs in aquaculture practice. In the future, much more research is required to standardize the optimal dose of different biopesticides for non-targeted organisms.

References

Murussi, C. R., Menezes, C. C., Nunes, M. E., Araújo, M. D. C. S., Quadros, V. A., Rosemberg, D. B., & Loro, V. L. (2016). Azadirachtin, a neem-derived biopesticide, impairs behavioral and hematological parameters in carp (Cyprinuscarpio). *Environmental toxicology*, 31(11), 1381-1388.

Saravanan, M., Kumar, D. V., Malarvizhi, A., & Ramesh, M. (2010). Biosafety of Azadirachtaindica (A. Juss) leaves extracts on certain biochemical parameters of Labeorohita. *Journal of Biopesticides*, 3(Special Issue), 227.

Kumar, S., Raman, R. P., Kumar, K., Pandey, P. K., Kumar, N., Mallesh, B., & Kumar, A. (2013). Effect of azadirachtin on haematological and biochemical parameters of Argulus-infested goldfish Carassiusauratus (Linn. 1758). Fish physiology and biochemistry, 39(4), 733-747.

Biosynthesis of Nanoparticles - A New Horizon in Fish Biomedicine

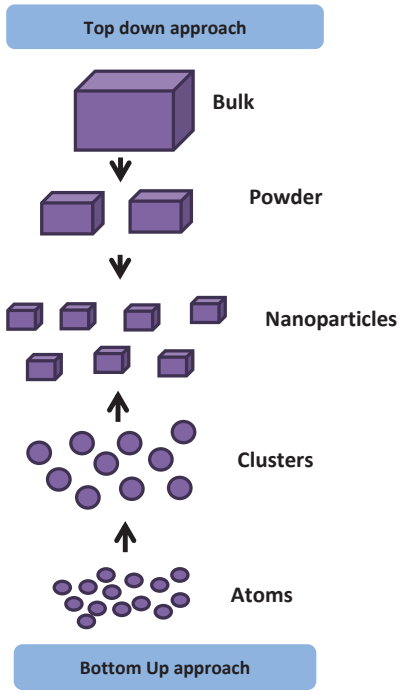
M. Dhayanath and Abisha Juliet Mary. S. J,
Department of Aquatic Animal Health Management, Central Institute of Fisheries Education, Mumbai.
Email: thrilldhaya007@gmail.com

Highlight Points

The biogenic nanoparticle has becoming a significant potential technology as the result of phytomining which revealed that metals are usually deposited in the form of nanoparticles. The various biological agents in the form of algae, plants and microbes have emerged as an efficient candidate for the synthesis of nanoparticles. These biogenic nanoparticles are cost efficient, simpler to synthesize, and focus toward a greener approach. This approach involves producing biomolecules from plant extracts to reduce metal ions to nanoparticles in a single step which also has an added advantage of being environmentally benign, as it majorly involves water soluble plant metabolites. This greener approach in nanoparticle production against fish pathogens can become an asset for the future aquaculture industry as it serves as a potential alternative to antibiotics which leads a sustained infection – free environment which is the impossible dream for many aquaculturists.

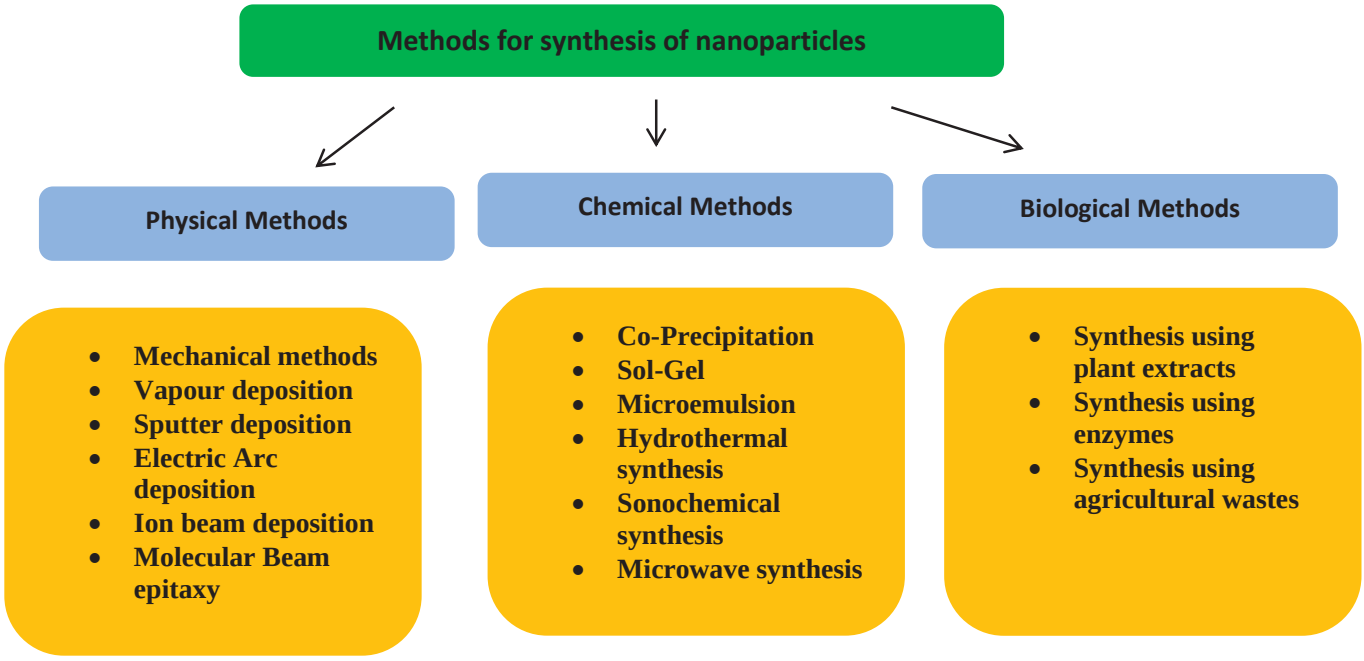
Introduction

Nanoscience will leave no field untouched by its ground breaking technical innovations but so far the use of nanoscience in fisheries has been predominantly theoretical. Nanoparticles are clusters of atoms in the size of 1-100nm. Metallic NPs are promising as they contain remarkable antibacterial properties due to their large surface area to volume ratio and have high surface atoms. Silver nanoparticle is stable in their inert form and also exhibit antimicrobial properties by inducing the production of reactive oxygen species such as hydrogen peroxide. Nowadays, a wide variety of nanotechnological applications were arising for the infectious disease treatment which involves micro emulsions, vaccines and metallic, inorganic, lipid and polymeric – based nanoparticles. There were two important metal nanoparticles which were gold and silver nanoparticles. The conclusion of various researches has been shown that silver and its compounds have strong inhibitory and microbicidal activities for bacteria, fungi, and virus. Compared with other metals, silver exhibits higher toxicity to microorganism while it exhibits lower toxicity tomammalian cells. More recent advancement in researches on metal nanoparticles, silver nanoparticles (SNPs) has lot ofscope for health care products such as burn dressings, scaffolds, water purification systems, antimicrobial applications and medical devices. The production of nanoparticles using the chemical methods has been raising concern among the environmentalists as they have an adverse effect on their ecology, hence the use of plant extracts for the formation of nanoparticles is being favoured due its salubrious nature towards the environment. Even in the industry it produces much lesstoxic waste. So this bionano technology, combines biological principles with physical and chemical approaches to produce nano-sized particles with specific functions. Various plant metabolites such as terpenoids, polyphenols, sugars, alkaloids, phenolic acids, and proteins, play an important role in the bioreduction of the metal ions. This article mainly focuses on this emerging green synthesis of nanoparticles with respect to fish medicine applications.



Different approaches to nanofabrication

For nanofabrication, there followed two common procedures which were top - down and bottom – up approach. Assembling individual atoms and



molecules to form nanoparticle describes bottom up approach and top-down approach involves fragmenting material to yield a nanoparticle.

Synthesis methods

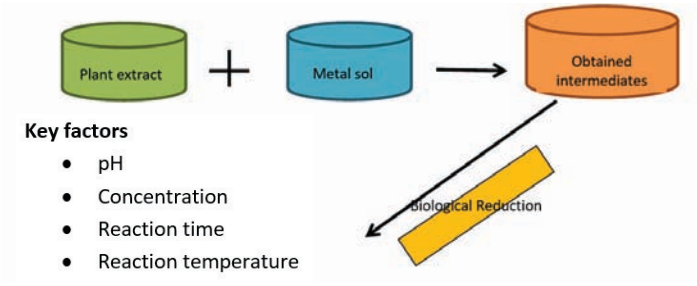
There were 3 common methods for synthesizing nanoparticles which were described below in the figure.

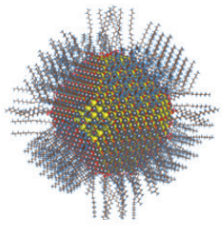
Among the above described methods, the physical method of synthesizing is time and energy consuming and this involves synthesis at high temperature and pressure. The chemical method is simple and inexpensive and low temperature synthesis method, use of toxic reducing andstabilizing agents makes it harmful. The most important green synthesis of nanoparticles were easy, efficient, and eco-friendly and this method eliminates the use of toxic chemicals, consume less energy and produce safer products and by products. The NPs synthesized in plant extracts already have a functionalized surface that can contain the organic ligands, proteins, polysaccharides and polyatomic alcohols that are absent in NPs synthesized using physical and chemical methods and this proves as a new platform in developing efficient nanoparticles which is recommended more.

Green synthesis

The formation of nanoparticles using plant extracts has a major edge over methods in terms of its interaction and effect on the environment; it is completely environmentally friendly and does not pose any threats even from its waste. During the process production of metal nanoparticles, the plant extract is simply mixed with a solution of metal salt at room temperature. It is a quick reaction and usually takes only minutes to complete. The developed nanoparticle properties and production time depend on various characteristics of plant extract, namely:

- its concentration,
- the concentration of the metal salt,
- the pH,
- temperature; and
- contact time





Various plant extracts were used for this green nanoparticle synthesize which are, aloe vera, neem, tea leaves, lemongrass, coriander, cinnamon, gooseberry, ginger, eucalyptus, hydrilla, sea weeds, mangrove plant extracts, hibiscus, latex, mint, tulsi, banana, lotus etc…

Antibacterial activity against fish pathogens

The mechanism of nanoparticles on bacteria are not fully elucidated, the three most common mechanism of toxicity proposed upto now are as follows.

- Uptake of free silver ions followed by disruption
- Formation of reactive oxygen species
- Direct damage to cell membranes

The applications of nanoparticles in aquaculture has promisingly seen in water quality improvement, aquatic animal nutrition, drug delivery, disease diagnosis and management but very few works has been done in the greener approach as it is forming a new horizon in the aquaculture era. Moreover, several reports are availablewhich have shown that Ag NPs are effective against

pathogenic organism namely *B. subtilis*, *Vibrio cholerae*, *E. coli* and reported that Ag NPs with larger surface area provide a better contact with microorganisms. The nanoparticles with leaves of *Mangiferaindica* (mango), *Eucalytusterticonis*, *Carica Papaya* and *Musa paradisiaca* (banana) plants has developed and tested against *Aeromonahydrophila*. Among them, synthetized nanoparticles with *Carica papaya* (papaya) show antimicrobial activity with 153.6 µg mL-1 concentration. In 2015, the antibacterial activity of green synthesized CuO nanoparticles was tested against *Aeromonashydrophila, Pseudomonas fluorescens* and *Flavobacteriumbranchiophilum*, which are responsible for causing severe infectious diseases in fishes. CuO NPs exhibits enhanced antibacterial activity against all the fish pathogens even at lower concentrations, i.e. above 20 mu g/mL. Further research in 2016, theAgNPs application, using as reductor agent *Azadirachtaindica* were used toevaluate the immune modular effect in infected mirgal with *Aeromonahydrophila*.Further works on antimicrobial activity of *Leucasaspera*-engineered silver nanoparticles against *A. hydrophila*infections were done in catla*Catlacatla*. In-vivo analysis of biochemical parameters and histological architecture provided evidence for the antibacterial effect of silver nanoparticles in catla. Silver nanoparticles synthesized using tea leaf extract (*Camellia sinensis*) demonstrated bactericidal activityagainst *Vibrio harveyi* in juvenile *Feneropenaeusindicus*, but only at high doses of the nanoparticles. Moreover, broth of Aloe leaf extract was used for green synthesis of zinc oxide nanoparticles (ZnO-NPs), which showed higher bactericidal activity against *A.hydrophilla*. Leaf bud extractfrom mangrove *Rhizophoramucronata* for biological synthesisof Ag-NPs, then demonstrated antimicrobial effects against Pseudomonas*fluorescens*, *Proteus* species and *Flavobacterium*species. The brief discussion on the recent researches on the green nanoparticle applications in fish antibacterial activity described aboveis given in the table below.This green approach in the fish medication of nanoparticles is shown to be a perfect therapy in future if researches have taken seriously in aquaculture industry.

Table 1. Green nanoparticle application against fish pathogens

AgNPs characteristics	Microorganisms	Authors
Synthetized nanoparticles with leaves of Mangiferaindica, Eucalytusterticonis, Carica Papaya and Musa paradisiaca plants	Aeromonahydrophila	Mahanty e. al. 2013
Green synthesized CuO	Aeromonashydrophila, Pseudomonas fluorescens and Flavobacteriumbranchiophilum,	Swain et.al., 2014
AgNPs using Azadirachtaindica	Aeromonahydrophila	Rather.,et.al., 2016
Leucasaspera-engineered AgNPs	Aeromonahydrophila	Antony., et.al., 2012
AgNP using leaf bud extract from mangrove Rhizophoramucronata	Pseudomonas fluorescens, Proteus species and Flavobacteriumsp	Umashankari., et.al., 2012
AgNP using tea leaf extract	Vibrio harveyi	Vaseeharan. ,et.al., 2010
ZnO-NPsusing Aloe leaf extract	Aeromonahydrophila	Gunalan., et.al., 2012

Conclusion

Current research in biosynthesis of nanometals using plant extracts has opened a new era in fast and nontoxic methods for production of nanoparticles. Different methods (physical, chemical and biological) have been developed to obtain NPs of various shapes and sizes. Among that this biological method of NPs is economically and environmentally friendly alternative to chemical and physical approaches. But the exact mechanism of synthesis of biogenic nanoparticles needs to be worked out. Based upon the above discussions it can be said that the synthesis of green nanoparticles may serve as a future direction in fish biomedical nanotechnology in developing antimicrobial compounds that are still to be explored.

References

Ahmed, S., Saifullah, Ahmad, M., Swami, B.L. and Ikram, S. (2016). Green synthesis of silver nanoparticles using Azadirachtaindica aqueous leaf extract. *Journal of radiation research and applied sciences*9(1), pp.1-7.

Antony, J. J, Nivedheetha, M, Siva, D, Pradeepha, G, Kokilavani, P, Kalaiselvi, S, et al. (2013). Antimicrobial activity of Leucasaspera engineered silver nanoparticles against Aeromonashydrophila in linfectedCatlacatla. Colloids Surf B: Biointerfaces109:20-4.

Bandeira Junior, G., Sutili, F.J., Gressler, L.T., Ely, V.L., Silveira, B.P., Tasca, C., Reghelin, M., Matter, L.B., Vargas, A.P.C. and Baldisserotto, B.(2018).Antibacterial potential of phytochemicals alone or in combination with antimicrobials against fish pathogenic bacteria. *Journal of applied microbiology*, *125*(3), pp.655-665.

Gunalan, S, Sivaraj, R, Rajendran, V. (2012). Green synthesized ZnO nanoparticles against bacterial and fungal pathogens. Prog Nat SciMater Int22(6):693-700.

Mahanty, A, Mishra, S, Bosu, R, Maurya, U. K, Netam, S.P, Sarkar, B.(2013).Phytoextracts- synthesized silver nanoparticles inhibit bacterial fish pathogen Aeromonashydrophila. Indian journal of microbiology 53(4):438-446.

More references can be provided on request.

Team Agrotech

YOUR STEPPING STONES IN SUCCESS!!

Country Representative
CPM ASIA

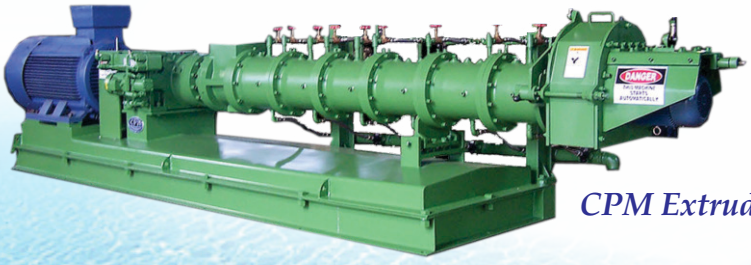
Your Single Stop Source for

Complete Project management of Turnkey Solutions in the following areas:

1. Integrated Feed plants for Poultry, Floating Fish, Sinking Fish, Shrimps, Cattle etc.
2. Balance of plant eqpuipments for Pre/Post processing
3. Complete Plant Automation Solution, on **GATE In to GATE Out concept.**
4. In-house design and manufacturing of Pre Fabricated steel structures for Plants, Warehouses etc.

CPM Dryer

CPM Pellet Mill



CPM Extruder

Contact Today

Team Agrotech Pvt. Ltd.

1- 4, 249, Hill Road, Gandhi Nagar, Nagpur-10 , Maharashtra, India.
M. : +91 9422803386, +91 9650559095
Ph. : +91 712 2222142
e-mail : teamagrotech@yahoo.com
Website : www.teamagrotech.com

For Queries Contact

Scan me

New technology to allow fleets to double fishing capacity and Commercial fishing - at a glance

Email: felixfisheries@gmail.com

Dr Jaya Naik
Dept. of FET, Fisheries College, KVAFSU, Mangaluru, India

Introduction: An increase in fishing power is known as 'technological creep' and it's usually ignored by fisheries managers who are in charge of regulating how many days and hours and technique each vessel under their oversight is supposed to fish in a given period. "This means that if a fleet has 10 boats today, one generation later, the same 10 boats have the fishing power of 20 vessels. The next generation, they have the power of 40 boats, and so on," said Deng Palomares, the *Sea around Us* project manager and lead author of the study.

"This 'technological creep' is also ignored by most fisheries scientists in charge of proposing policies," said Daniel Pauly, the *Sea around Us* principal investigator. "They tend to conduct short-term studies that only take into account nominal effort, which is, for example, the number of boats that fish using longlines in one year, employing 'x' number of people. However, they are disregarding the effective effort those vessels are deploying thanks to the technology that allows them to either maintain their catches or catch more fish".

"This is important because if you don't understand that the increase in power is happening, then you don't understand that you can deplete a stock," Pauly said. "We already know that marine fisheries catches have been declining by 1.2 million tons per year since 1996 so, by prompting boats to fish deeper and farther into the high seas, these new technologies are only helping the industry compensate for the diminishing abundance of fish populations".

How to Keep Fish in the Sea and on the Plate

Temporary bans on fishing can be better than permanent ones as a way of allowing fish stocks in an area to recover, while still providing enough to eat, a research team has found.

Highlight Points

- Industrial fishing fleets have doubled the distance they travel to fishing grounds since 1950, which means that they are now able to reach 90 percent of the global ocean, but are catching only a few tons for each of the fishing vessels registered under the concerned state governments.
- Commercial fishing is the activity of catching fish and other seafood for commercial profit, mostly from wild fisheries. It provides a large quantity of food to many countries around the world, but those who practice it as an industry must often pursue fish far into the ocean under adverse conditions. Large-scale commercial fishing is also known as industrial fishing.

Fishing for Fun, Not Food: Study Takes Stock of Recreational Fishing Impacts

A new study by an international team of researchers argues that decision-makers and fishing organizations must recognize the growing role of recreational fishing and the potential pressures it places has to be reduced considerably.

EU Fisheries Failures Jeopardise Sustainability of Small Fishing Communities, Researchers Argue

Traditional artisanal fishing has been harmed by EU fishing policies that favor big businesses and ignores other more sustainable approaches to conserving fish stocks, according to new policies and laws.

Fishing Fleets Travelling Further to Catch Fewer Fish

Industrial fishing fleets have doubled the distance they travel to fishing grounds since 1950, which means that they are now able to reach 90 percent of the global ocean, but are catching only a few tons for each of the fishing vessels registered under the concerned state governments.

The University of British Columbia analyzed more than 50 studies related to the increase in vessels' catching power and found that the introduction of mechanisms such as GPS, fish finders, echo-sounders or acoustic cameras, has led to an average two percent yearly increase in boats' capacity to capture fish.

Commercial fishing

*Commercial fishing is the activity of catching fish and other seafood for commercial profit, mostly from wild fisheries.

It provides a large quantity of food to many countries around the world, but those who practice it as an industry must often pursue fish far into the ocean under adverse conditions.

Large-scale commercial fishing is also known as industrial fishing.

This profession has gained in popularity with the development of shows such as Deadliest Catch, Swords, and Wicked Tuna.

The major fishing industries are not only owned by major corporations but by small families as well.

The industry has had to adapt through the years in order to keep earning a profit.

A study taken on some small family-owned commercial fishing companies showed that they adapted to continue to earn a living but not necessarily make a large profit.

It is the adaptability of the fishermen and their methods that cause some concern for fishery managers and researchers; they say that for those reasons, the sustainability of the marine ecosystems could be in danger of being ruined.

Commercial fishermen harvest a wide variety of animals, ranging from tuna, cod, carp, and salmon to shrimp, krill, lobster, clams, squid, and crab, in various fisheries for these species.

There are large and important fisheries worldwide for various species of fish, mollusks, crustaceans, and echinoderms.

However, a very small number of species support the majority of the world's fisheries.

Some of these species are herring, cod, anchovy, tuna, flounder, mullet, squid, shrimp, salmon, crab, lobster, oyster and scallops.

All except these last four provided a worldwide catch of well over a million tonnes in 1999, with herring and sardines together providing a catch of over 22 million metric tons in 1999.

Many other species are fished in smaller numbers.

The industry, in 2006, also managed to generate over 185 billion dollars in sales and also provide over two million jobs in the United States, according to an economic report released by NOAA's Fisheries Service.

Commercial fishing may offer an abundance of jobs, but the pay varies from boat to boat, season to season.

Summary:

Technological advances and Commercial fishing are allowing commercial fishing fleets to double their fishing power every 35 years and put even more pressure on dwindling fish stocks, new research has found.

FISH PROCESSING AS ZERO-WASTE FOOD INDUSTRY

Itishree Das[1], Dr A.K. Balange[2], Dr Layana P[3] and Sandeep Shankar Pattanaik[4]
[1]P.G. Scholar, Fish Processing Technology Department, ICAR-CIFE, Mumbai, India.
[2]Principal Scientist, Fish Processing Technology Department, ICAR-CIFE, Mumbai.
[3]Scientist, Fish Processing Technology Department, ICAR-CIFE, Mumbai.
[4]Assistant Fishery officer, Odisha, India.
Email: itishree.phtmb010@cife.edu.in

Highlight Points

1. As one of the top most growing sectors globally, the aquaculture and processing industry is developing rapidly.
2. With the increase in its products, the processing industry also produces many byproducts.
3. The waste produced in this industry can be reused in fisheries sectors again by converting it to high valued items.
4. This also proves that the rapidly growing processing sector is also a zero-waste industry.

INTRODUCTION

The time gap between the fishes are captured or caught and the finished product is shipped to the consumer is called as fish processing. Although the term applies primarily to fish, it is generalized in practice to include all aquatic species harvested for commercial purposes, whether captured in wild fisheries or harvested from aquaculture or fish farming. The industry dealing with making the unwanted part of fish and shellfish usable and economical is the processing industry. Processing of fish leads to huge amount of waste. The waste generated after fish filleting is about 75% of the fish weight. It is estimated that about 30% of the waste are from skin and bone. These materials can be used to produce many value added products as these are rich source of collagen. Similarly from shrimp a waste of about 35-40% generated from cephalothorax and carapace. The waste generated from squid rings and cuttle fish rings are 55% and 50% respectively. Deep sea shrimp meat yield is about 30-35% and waste generated about 65-70%. In surumi industry waste generated about 70-75%, for ex- if we take 1000 grams raw material then yield is about 300 grams. The maximum waste generated from shrimp followed by finfish and cephalopods. These waste generated are a source of pollution which need to be tackle. Utilization of these raw materials can be a better source of income as well as helps to prevent pollution created by this.

WASTE PARTS AND ITS UTILIZATION

Fish skin is rich source of collagen and can be used as animal feed. This collage is allergy free. Fish bones are good source of calcium and can be used for various purposes. Fish scales are a source of collagen protein and hydroxy appetite. Even fish viscera have proteins, enzyme and fat that can be used for many purposes. There are total 67 fish meal and fish oil producing industry in India. Out of these there are 28 industries in Karnataka, 16 in Tamilnadu, 6 in Mumbai. These sectors are also increasing day by day to meet the growing aquaculture sector. These companies use fish offal, trash fish, by catch fish.

From last ten years indian fish processing industry are purely focused with shrimps largely because of high market demand in abroad. Basically the carpace and cephalothorax are the main waste from these industry but these are rich source of chitin. For example we will get 30-40gms of chitin from 1kg shrimp. Then the chitin is converted into chitosan and glucosamine hydroclodide for more application because these for have more economic value.The export of shrimp has not been healthy in these days because the industry has failed to diversify itself to different fish and fishery products. In some areas the freezing and canning units remain underutilized due to lack of shrimp raw material.

Even now scientist are working to recover the proteion that leach out during processing of seafood during blanching processes near about 2-3g protein is lost from a 1kg shrimp. There are some processes like flocculation, filteration method to recover this, but still work is going on to make more efficient method to recover these protein.

The judicious and scientific exploitation and utilization of available resources became important. This prevent or reduces the loss of fish during all processing stages. It is one of tool to sustain the industry with profit. The additional steps in this processes also increases the employment opportunities as well as environmentl pollution can be controle.

FISH MEAL AND FISH OIL

Fish meal and fish oil are obtained from fishes by wet or dry reduction method. Currently fish meal, fish oil plays an important role. As the aquaculture sector is growing so fast that to support this sector fish meal is important as it is an important part of fish feed. Talking about fish oil it is rich source of omega 3, vitamin A and vitamin D. This plays an important role lowering blood cholesterol level, reducing heart diseases, increase good cholesterol, helpful in improving skin, reduces inflammation, repairing wounds etc. while production of fish oil there is a production stick water as byproduct and this is used as follicle sprays.

SQUALENE

Squalene is obtained from shark liver which is a natural organic compound. Shark liver oil or Squalene is basically used in different cosmetic products starting from anti-aging creams, lotions, deodorants, hair conditioners, eye shadows, lipstick, lip balms, sunscreen, and cleansers.

According to WHO (World Health Organization) report in the year 2020 states that near about 42 candidates vaccines for corona virus in different stages of clinical test, and around 100 more in pre clinical stages. According to Shark allies survey that 17 vaccines uses adjuvants and out of these 17 near about 5 vaccines are using shark sqalene based adjuvants.

Some shark based adjuvants are also used in other diseases also like in flues vaccines, malaria. These squalen based adjuvants are used inoder to boost up the immunogenicity of that particular vaccine which will ultimately enhace the efficieny of the vaccines.

BIO DIESEL AND BIO GAS

Bio diesel produces from oil and fat from vegetable and animal is a substitute to the diesel produce from petroleum. The method of production of bio diesel from fish source is reported from Arvanitoyannis and Kassaveti (2007).

CHITIN AND CHITOSAN

Chitin is produce from crustaceans by demineralization and deproteinisation. Chitosan is obtained from chitin by deacetylation of it. Chitin is used in feed ingredient for animals and poultry. It acts as a Growth promoter and has beneficial changes in intestinal microflora. This reduces feed efficiency ratio and reduces cannibalism in farmed fish.

Chitosan used for synthetic fibers used as absorbable sutures and resist action of bile, urine and pancreatic juice. Chitosan-gelatin complex used for wound dressing materials as its wound healing property is excellent. Its adhesion to subcutaneous fat helps in Tissue regeneration. It also helps in Waste water treatment by chelation of heavy metals. It also helps in Photography by its film forming ability. It plays an important role in the world of Cosmetics. Thickening and stabilizing agent in foods. Act as a base for chromatography. Use as adhesive - paper, rayon, cellophane, wood, leather, rubber and glass.

FISH HYDROLYSATE

Fish protein hydrolysate is important fishery by product from the fish muscle. It is liquefied product prepared from fish meal or fish offal with the help of added enzyme or acid or alkali or chemically. It is used as a source of essential and highly absorbable amino acids. It is used as an ingredient in formulation of functional foods and source of health promoting peptides. It is used as foliar spray

FISH SILAGE

Fish silage is liquefied fish protein. Preservation of surplus fish and fish offal as silage can be use in animal feeding in an alternative to processing fishmeal. Fish silage is used as cattle feed. Either the whole mass or the decanted liquid portion can be used. When solid feed is desired, the silage is mixed with rice bran or other feed ingredients.

AMBERGRIS

Ambergris is a fatty substance obtained from intestine of sperm whale when they are sick. These are gray in colour. Fresh ambergris has a strong unpleasant smell and often hardens when expose to air and gives a sweet musty odour. It is mainly used in perfume industry as a fixative.

FISH MAWS AND ISING GLASS

These are produce from the swim bladder of fishes. These are used in clarification of wine. For instant 1gm of icing glass can clarify about 80-1000 l of wine. It also impacts excellent water proofing to textile fabrics. It is used as binder in the glass porcelain cements.

PEAL ESSENCE

It is the shining material obtained from the scales of fish containing lustrous material called guanine. This guanine is purine bases. Guanine combines with collagen which yields a silvery white shiny appearance. It is used for giving iridescent sheet to artificial pearl. At present facing problem from different synthetic substitutes.

HYALUONIC ACID

Fish is so useful product that even if its eyeball are of use .fish eyeball are a reach source of hyaluronic acid. Different research work id done to standartise the method of extraction of this hyluonic acid from fish eye ball. After stantardtisationHyaluonicAcid with high purity (more than 99.5%) are obtained by means of low-cost process using a waste material. This is very useful for clinical and cosmetic applications.

MEDICINAL PRODUCT DERIVED FROM FISH AND SHELLFISH WASTE

Many health oriented companies have chitosan as main ingredient in weight loss. For herbal life product have chitosan fiber complex tablets to enhance weight loss. Chitosan is called fat trapper. Chitosan is used to treat obesity and control high cholesterol by trapping the fats. It is also used to treat complications that kidney failure patients on dialysis often face.

Tilapia skin being used in xenograft treatment. Nile Tilapia Fish Skin (NTFS) has been suggested as an option of biological material to recover the burns by the world heathorganisation. Tilapia skin has normal non-infectious microbiota and high amounts of type I collagen which is similar to morphological structure of human skin. Tilapia skin also have high resistance and tensile extension at the break. Tilapia skin are innovative, and highly available product. This is the first nationally studied animal skin that is registered by the National Sanitary Surveillance Agency for use in the treatment of burns. There are many case studies of this particular treatmetment which are successful.

The advancement in technology, especially in the field of nanotechnology has leads to a greater development in fish processing industry. Chitosan derivatives have been prepared as nanomaterial's, including nanoparticles, hydrogels, microspheres, and micelles. These derivatives of chitosan is also used as targeted delivery vehicles for drugs, as well as adjuvants and vaccines.

Squalene is obtained from shark liver which is a natural organic compound. Squalene used in different pharmaceutical products and vaccines. Squalene is a component of some adjuvants that are added to vaccines to boost up the immuno response. Squalene by itself is not an adjuvant, but emulsions of Squalene with surfactants is able to boost the immunogenicity.

Another medicinal product fish oil tablets plays an important role in keeping the joints supple and mobile. It enhances positive impacts on nervous system. It also maintains healthy cholesterol level. Omega tablets are soft gel with coating that are easily absorbed and processed by the body.

Due to various their multiple health benefits, marine-derived bioactive peptides have recently sparked a lot of attention. Furthermore, due to their therapeutic potential in the treatment or prevention of disease, several studies have reported that marine bioactive peptides can be used as antihypertensive, antioxidative, anticoagulant, and antimicrobial components in functional foods or nutraceuticals and pharmaceuticals.

CONCLUSION

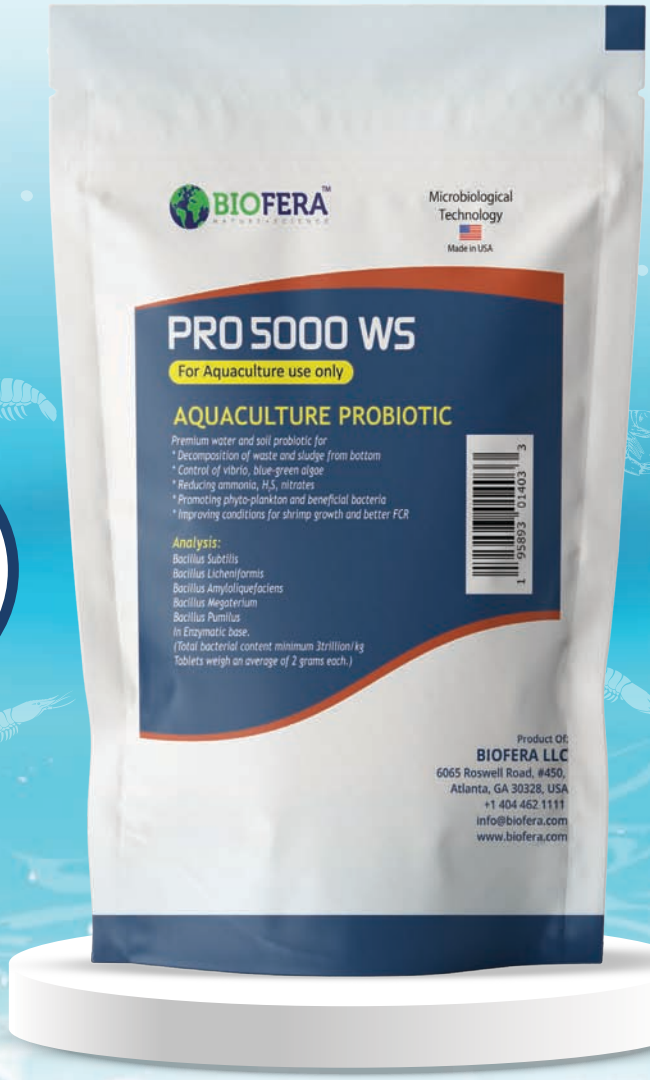
Aquaculture industry, a rapidly growing industry across the world, is producing food and its byproducts at a higher pace and the growth is not only showing in terms of quantity but also the quality of product is improved drastically. In the era of lab grown meat, the industry is providing food with zero waste at a sustainable price. The most important point in the growth of aquaculture is the medicinal benefit. From the above sources it can be clearly suggested that the fish and shell fish industries are providing food with zero wastage. For the proper utilization of each part of fish and shell fish, more and more advanced technology and huge raw materials are needed. Moreover, it will boost the economy of common people as well as reduce the production potential which causes mainly due to waste materials.

References can be provided on request.

Made in USA

PRO 5000 WS

BIOLOGICAL WATER/SOIL QUALITY IMPROVEMENT



FOR ENQUIRIES CONTACT
+ 91-8985279999

WORLD CLASS AQUACULTURE PROBIOTIC

BIOFERA™
NATURE + SCIENCE

PRODUCT OF BIOFERA LLC, ATLANTA , USA,


Bühler
Aqua Feed
Solutions.
The most important goal is the creation of a complete diet with the highest feed conversion rate, providing a healthy and easily digestible diet for fish. At the same time, the feed must maintain its shape and texture in water and be durable for transport and storage reasons.
We can help you with the entire process. From blending, mixing and grinding to control sifting, extruding, shaping, drying and coating/cooling, our experts can tailor an aqua feed solution to meet your specific needs.
Learn more
buhler.bangalore@buhlergroup.com
+91 80 6777 0000
Innovations for a better world.
BÜHLER

Postal Regn. No. HD/1068/2021-2023
Published on 7 July 2022