English Monthly from Hyderabad, India

RNI Regn. No. 52899/93

Aqua International

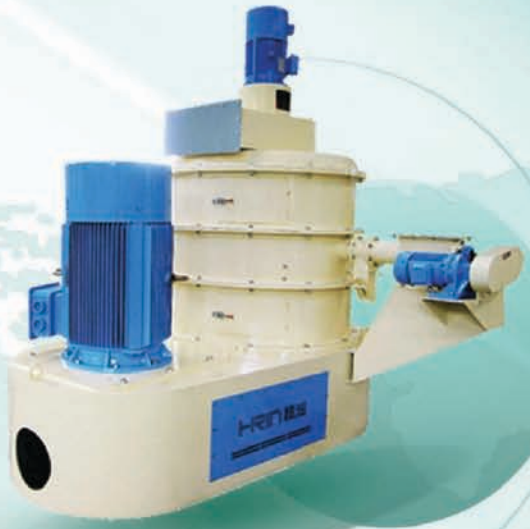
Estd. 1993

Health • Nutrition • Management • Processing

Annual Subscription: Rs 800 Foreign $ 100 January 2021

Inside...

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%.

Aqua International

English Monthly Magazine
(Established in May 1993)

Volume 28 Number 09 January 2021

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/1068/2018-2020.

NRS PUBLICATIONS
www.aquainternational.in

CONTENTS

ADVERTISERS' INDEX

Gentle Bio-Sciences Pvt. Ltd.

Excellence! Everyday In Every Way!!

BIOFLOC®

"High Density Water & Soil Probiotic specially designed for Shrimp culture"

SYNAMIN-FS®

CONCENTRATED LIQUID MINERALS ALONG WITH AMINO ACIDS AND GROWTH PROMOTERS

GENTLE®

LEADING THE WAY

MAXLIFE™

Natural Antibacterial Immuno-Modulator

SeedCare™

Seed Protection Formula

ALL OUR PRODUCTS REGISTERED WITH CAA AS ANTIBIOTIC FREE INPUTS

Regd. Off: Unit No.7, V.S.P.Homes, Road No.3, Madhavapuri Hills, Hyderabad-500 050. Telangana.
Ph : +91 7680079990
E-mail: gentleho2013@gmail.com

Gentle Biosciences Pvt. Ltd. ISO 9001:2015 CERTIFIED COMPANY

Marketing Off:# 59A-15-28, 1st Floor, Pantakaluva Road, Near NTR Circle, Patamata, Vijayawada-520010,AP.
Ph : +91 7680079988
E-mail: gentledirector1@gmail.com

www.gentlebiosciences.com

Make a resolution to be healthy and work better

Dear Readers,

Greetings from ***Aqua International*** for a Happy, Prosperous and Peaceful New Year 2021 to the readers, advertisers and the well wishers. The January 2021 issue of ***Aqua International*** is in your hands.

I wish that all of us get organized ourselves personally and in the profession well and perform better in this New Year 2021. In order to achieve it, we need to plan and implement our daily schedule of waking up early in the morning atleast by 6 AM, have some physical exercise and yoga, have balanced diet, spend eight hours of quality time for professional works and a night sleep of seven to eight hours. If you can maintain this schedule, you will not only prosper in your profession, but also keep yourself fit physically and mentally. Check your Blood Pressure, Sugar and Cholesterol levels time to time, take precautions and maintain good health. Make a resolution to keep yourself healthy and work better. I am doing it since long and please try to maintain it to keep yourself healthy and active. I wish you all the best in your performance !

In the News section, you may find news – India's mariculture sector is on a course of transformation with the country accelerating attempts to enhance its marine fish production by diversifying mariculture. In its latest efforts aiming to boost the production, the country has successfully developed seed production technology of John's Snapper (Lutjanusjohnii), a high value marine fish, to utilize it as a candidate species for mariculture. Central Marine Fisheries Research Institute informed that they developed this technology. According to marine scientists, this is a game-changer as it would open up enormous scope for the country's mariculture ventures in near future through species diversification. Snappers are in high demand and much sought after variety in India with a farm-gate price of Rs 400 a kg ($5.42) for this fish. "It is an excellent species for mariculture owing to its fast growth rate, efficient feed conversions, fantastic meat quality and superior consumer preference. Please see News on page no 8.

All India Shrimp Hatcheries Association says that licensing policy in aquaculture sector by the government should be made simple and views of the stakeholders of the industry should be taken into consideration before finalising the policies. Hatcheries are supposed to sell shrimp seed to licensed farmers, but it is not happening. India has 550 hatcheries with a production capacity of 120 billion seed, whereas they are producing around 70 billion seed annually. India now has sufficient size of Broodstock to produce seed. During Covid-19 pandemic hatcheries faced problems from the local people and the fisherman community due to which many hatcheries suffered.

In a first of its kind initiative, the Marine Products Export Development Authority has launched a multilingual call centre for aquaculture farmers at Vijayawada in Andhra Pradesh, which will address their technical issues and impart knowledge about efficient farming methods by domain experts round the clock. Launching the call centre through video conference on 15 December 2020, MPEDA Chairman Mr K. S. Srinivas appealed to the farmers in Andhra Pradesh to seek advice from experienced experts for addressing their concerns and to follow Best Management Practices to boost production and ensure quality of the produce.

MPEDA conducted five days training programme for the benefit of 15 scheduled tribe beneficiaries of Nirmala Nagar, Tummala, Repalle Mandal, Guntur district, Andhra Pradesh from 3 to 7 November 2020.

Trouw Nutrition - a Netherland based Nutreco company, announced its maiden manufacturing foray in India with a state-of-the-art production facility at Jadcherla near Hyderabad recently. Nutreco, through its two reputed brands, Trouw Nutrition and Skretting, is a global leader in animal and aqua nutrition, bringing innovative feed additives, premixes and nutritional services. It is the animal nutrition division of the 125 year old Dutch family owned SHV Holdings. SHV has interests in energy, retail, heavy engineering and investments and clocked sales of € 19.2 billion in 2019, from its global operations. "

Aqua International invited stakeholders in Aquaculture sector to send their observations, views and opinion on how the industry was in the just concluded 2020 and how they see the New Year 2021 for the sector. We published views of some stakeholders in this issue and remaining will be published in February 2021 issue of this magazine.

M.A.Nazeer
Editor & Publisher
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

Marine fish production: India shifts focus to diversifying mariculture, develops seed production technology of John's Snapper

The country targets 4 to 5 million metric tonnes of fish production in the next 10 years from mariculture

India's mariculture sector is on a course of transformation with the country accelerating attempts to enhance its marine fish production by diversifying mariculture.

In its latest efforts aiming to boost the production, the country has successfully developed seed production technology of John's snapper (*Lutjanusjohnii*), a high value marine fish, to utilize it as a candidate species for mariculture.

Game-changer in mariculture

This technology was developed by the ICAR-Central Marine Fisheries Research Institute (CMFRI), India's premier research body in marine fisheries. According to marine scientists, this is a game-changer as it would open up enormous scope for the country's mariculture ventures in near future through species diversification. Snappers are in high demand and much sought after variety in India with a farm-gate price of Rs 400/kg ($5.42) for this fish.

Metamorphosed fry John's snapper close-up

Hon'ble VPI observing the fingerlings

"It is an excellent species for mariculture owing to its fast growth rate, efficient feed conversions, fantastic meat quality and superior consumer preference. John's snapper seeds globally have only been produced in Singapore with limited success. This is the first instance in the country that snapper seeds have been produced", said Dr Shubhadeep Ghosh, Senior Scientist of ICAR-CMFRI at its Visakhapatnam Regional Centre. In India, the fish is reported from both the west and the east coasts. It inhabits mostly the coral reefs and rocks, deep seas, and occasionally in estuaries, he stated.

In an apparent significance of the new development, India's Vice President, M. Venkaiah Naidu himself came into the scene to release the technology on 07 December 2020 at the Visakhapatnam Regional Centre of CMFRI. He handed over the country's first-ever bred snapper seeds to two progressive fish farmers in a symbolic gesture of dedicating the same to the nation. According to the Vice President, the success in snapper seed production and subsequent farming of the species in marine cages would fulfil the domestic demand of marine fish as the cheap and the best source of animal protein. The existing gap in the country between the seafood demand and supply could be addressed in a way diversifying the species for mariculture, he said. "With expansion of marine cage farming, huge increment in employment generation is expected. At least three people are employed directly or indirectly while producing every tonne of fish through mariculture", he added.

Targeting 4 to 5 million metric tonnes in next 10 years from mariculture

A report of Blue Economy published by the Economic Advisory Council to the Prime Minister of India shows that India targets 4 to 5 million metric tonnes of fish production in the next 10 years from mariculture. The development of the technology of the snapper as part of species diversification is primarily aimed at achieving this target by enhancing the marine cage farming system across the coastal states of the country. According to this report, India requires

Handing over the seeds to a farmer

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.

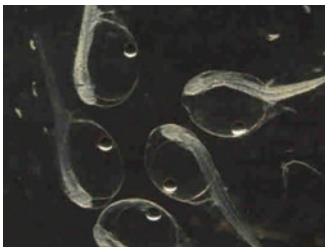
FAMSUN Co., Ltd.

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



Just hatched out larvae of John's snapper

18 million metric tonnes of total fish production by 2030 to meet the growing food demand in the country.

This is the sixth marine food fish of which breeding technology has been developed by the ICAR-CMFRI. Earlier, CMFRI had succeeded in brood stock development and round the year seed production of finfishes like cobia, silver pompano, Indian pompano, orange-spotted grouper and pink ear emperor.

The research work for developing the seed production technology of the snapper started during 2018-19 under a project which was financed by the Department of Biotechnology, Govt. of India.

"With production of snapper seeds on a consistent basis, Indian mariculture is poised for a new surge with exponential increase in mariculture finfish production", said Dr A. Gopalakrishnan, Director of CMFRI.

Adult John's snapper

Limited scope in marine fishery

India's marine capture fishery is facing a number of issues such as resource depletion, ecosystem degradation and marine pollution which are attributed by marine scientists to climate crisis. The marine fish landings in the country have been fluctuating between 3 and 4 million tonnes for during the last decade. The latest marine fish landings data published by CMFRI recorded 3.56 million tonnes in 2019 with the commercially unimportant red-tooth trigger fish being the most landed species (2.74 lakh t). With limited scope for increasing the production from capture, the scientists of CMFRI are of the view that the equal emphasis should be given to enhance mariculture.

"For the past few years, CMFRI is focusing on producing quality seeds of commercially important species suitable for cage farming, which was started in the country in 2005", Dr Gopalakrishnan stated. Realizing that non-availability of quality seeds remain a major constraint to achieve the potential of mariculture, the country started developing technologies for seed production of cobia, silver pompano, grouper, Indian pompano and pink ear emperor at the various research hatcheries of CMFRI located in different parts of the country, he said.

Vice President with a model cage

Brood Bank for Cobia and Silver Pompano

"Two national brood bank facilities, each for cobia and silver pompano,are being operational at Vizhinjam in Kerala and Mandapam in Tamil Nadu. Over the past half a decade, consistent seed production was achieved and the seeds are supplied to fish farmers and to the industry as a whole. The efforts are on to diversifying the species which is the need of the hour to augment marine fish production", Dr Gopalakrishnan said.

"The increasing contribution of marine fisheries to the GDP growth are supported by the robust research efforts of the institute and its impact on fisher folk, fish farmers, fisheries policy planners and managers", he said.

- Courtesy: ***K V A Khadar***

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

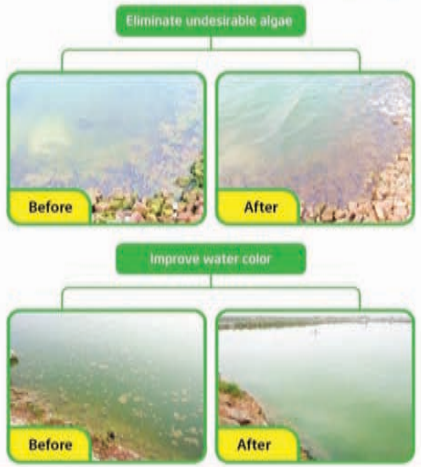
No cultivation is needed. Easily adapt to the changes of surroundings and grow fast in freshwater or seawater culture farming, even under low oxygen environment

3. DECREASE AMMONIA CONTENT

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

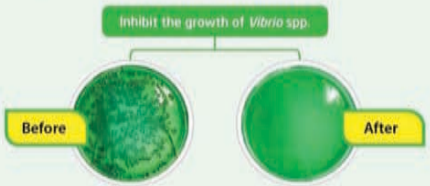
4. IMPROVE WATER COLOR

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:

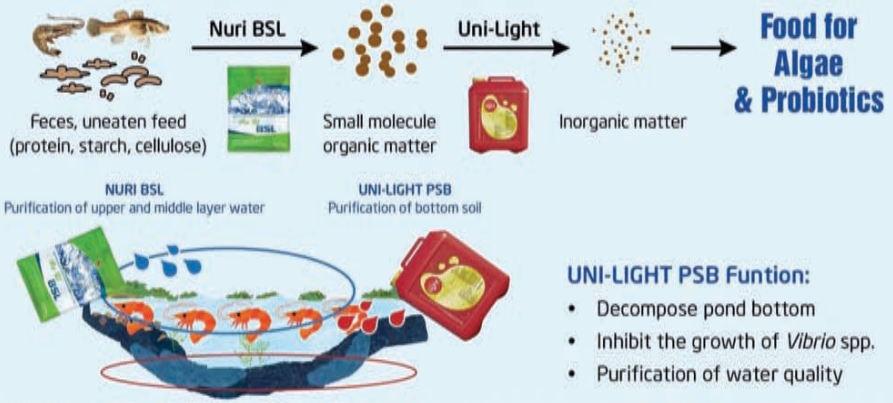
Bacillus spp. > 1x 10^{11} cfu/kg	15%
(Bacillus subtilis, Bacillus amyloliquefaciens, Bacillus licheniformis)	
Carrier (rice bran, corn gluten)	75%
Moisture	10%

* 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 m² 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

Webinar held on Freshwater Aquaculture in India during COVID-19

Vijayawada, 15 December 2020: The Webinar entitled 'Scenario of freshwater aquaculture (FAq) in India during COVID-19 pandemic' was organized by RRC of ICAR-Central Institute of Freshwater Aquaculture, Vijaywada, Andhra Pradesh on 15 December 2020. Inaugural address was given by Hon'ble Dr S. Ayyappan, Former DG, ICAR, New Delhi and Chancellor, Central Agricultural University, Imphal. Dr Ayyappan spoke about Vision 2020 document prepared at CIFA during 1999-2000, where everything was focused from fish seed to market except COVID-19. He gave a presentation on 'Fish 2 Home (beyond COVID-19)', people speaks about bringing fresh food home; discussed about accomplishing seven goals related to agriculture out of 17 UN SDGs in next ten years; annual global foodgrain production; Asia as fulcrum of global food production, both land-based and aquatic; issues like glaring malnutrition of unacceptable levels, food loss and waste; water to protein ratio highest in its efficiency in FAq, producing protein at low cost; remembered 'foodprints' in Indian agriculture, viz., Dr M. S. Swaminathan, Norman Borlaug, V. Kurien and Dr H. L. Chaudhuri; fish fits in very well in FSSAI 'Eat right' campus; doubling farmers' income (integration with other farming systems, cluster-based farming, diversification, enhancing efficiency); increasing quantum of production and also ensuring safe, nutritious, wholesome food; food production systems (more production from less resource, protein production, value addition, employment and environment as important ingredients in it).

Dr Ayyappan continued discussing on importance of assessing domestic fish consumption (DFC) pattern properly that can be increased in Eat Right campaign; pilot studies on actual fish consumption. During COVID-19, farm-produced shrimps couldn't be exported and importance of domestic markets understood; 'Farmer-to-Consumer-direct' transaction reinforced. In boosting DFC, creation of stable domestic market for high value produce needed, also customized cold chain models for fish at doorsteps. Swiggy model may help in delivering fish at home at earliest since it is perishable. Utilization of aquatic genetic resource (GR) is 0.42% in India but its potential is four folds. In evaluation of new GR for domestication, aspects like market acceptability & economics, fecundity & growth in captivity, broodstock availability & breeding acceptability to fed-system, compatibility in RAS, Biofloc systems must be looked into. Discussing on issues and opportunities in FAq, Dr Ayyappan spoke about customized practices with quality assurance (blue water, green water), quality seed of diverse species, fish feed and health, tackling disasters and introduction of novel insurance schemes like in agriculture, programme for domestic supply chains.

FAq is an absolute fit food production system. New schemes can be taken up on re-emphasizing on propagation of fish species declared as State Fish. New technologies like Agri start-ups, IoT, Big data Analytics, digital farming, FPOs are coming into FAq, we have to bring in more stakeholders and partners; Hydroponics, Aquatorium are 'Food plus' opportunities in FAq. Dr Ayyappan cited instances of farm innovations in integrated farming system, hydroponics, terrace farming, RAS; more youths have to be brought in. FAq has to contribute over 50% to country's fish basket. Breed of aquapreneurs quickly coming up in FAq, aggregation with customized cold chains is a possibility, innovations for enhanced shelf life needed avoiding unhealthy preservation methods. Huge social capital and equity is possible with FAq, most marginal people involved in FAq in eastern India. India can reach 22 million tonne target of fish production in year 2025 (FAq 12.7 million tonnes) from 13.8 million tonne in 2020 (FAq 7.9 million tonnes); there is export potential, but FAq will be and has to be the mainstay in fish consumption of our countrymen and community, Dr Ayyappan mentioned.

As Guest of Honour, Dr J. K. Jena, DDG (Fisheries Science), ICAR spoke on heavy impact of COVID-19 on floriculture and all sub-sectors of aquaculture in India which cannot be underestimated. With technology and investment, achieving 22 million target by 2025 may be possible, but concern is whether our market will be able to absorb that much production. During April and May 2020, as harvest from ponds couldn't be done, price of fish came down by Rs 30/-/kg. Even if people start consuming more fish, will they have purchasing power? Dr Jena stated that 1971 Bengal famine was brought about, according to Dr Amartya Sen, by shortage of food grains due to drought situation for two years and very less purchasing power of people. People didn't had money then, and now in COVID-19 times, people have job loss and income reduction. Will people have enough capacity to buy fish continuously? Fish may be kept for additional 1-2 months in pond in lockdown period but will pisciculturists have capacity to purchase more feed for those fishes? Dr Jena discussed such issues, also loss incurred by farmers due to low market price.

About 50% of fish seed is sold in April and May every year (peak fish breeding period) in about 1000 hatcheries in WB; about 6000 crore carp spawn produced in WB in this time (out of 10000 crore in a year), which was not possible in 2020. No transportation available for seed to other states, impact will be felt for

another 1-2 years. No seed, so no farming and harvesting. Ornamental fish trade in North and South 24 Parganas districts had devastation, price of fish reduced, about 20000 people connected with wholesale, trade and fish collection suffered. With no export of farmed shrimps for 2-3 months, farmers couldn't sell it at right price, seeds couldn't be stocked in ponds in several places, hindrance observed in shrimp feed supply. Dr Jena further stated that shrimp farming industry depends on SPF broodstock imported from other places, shrimp seeds hadn't been imported in 2-3 months of lockdown. With Government's expectations in next five years about increasing income and fish production, latter will not be a problem with new technologies entering and intensive farming practices demonstrated; market is a issue that will remain in coming days. If small markets absorb 20kg / day of high-value fish like Amblypharyngodon mola, 25-30% price probably will fall if 40kg is brought herein next day. Probably price of high-value fishes will come down if supply is increased, markets for such fishes should be created slowly and steadily. Farmers and entrepreneurs expect an assured income at end of day in addition to hoping about good production; there should be ready market where they can sell their produce with good profit, Dr Jena explained. We must think about farm-gate price of new fish species, not just retail price.

In mariculture, seed is a major hurdle as critical input in established open sea cages. Entrepreneurs willing to invest and establish hatchery of grouper, pompano, seabass, cobia today have to wait for 5-6 years to get broodstock; more support must be given to such private entrepreneurs. If marine fish seeds are imported, enough of full-fledged quarantine facilities is a problem. Demand for fish and new consumers should be created in slow pace. Doubling its production is possible in certain fixed target (years) but doubling consumption is not easy. If possible, domestic shrimp market can be created in north India and other places taking the message of eating fish. Quality and safety aspects must be given importance while increasing production and productivity. While discussing these aspects very lucidly, Dr Jena said that COVID-19 has taught us to have conversation in e-platform, that we have responsibility towards society, did helped others; stressed on necessity of cooperation, convergence, collaboration; that we have to provide cheap fish to everybody and farmers at the same time must get more price; consumers must have access to less-priced (cheap) fish and expectations of our country can be met if we join hands.

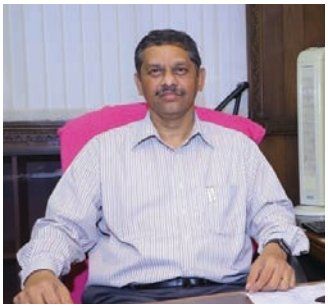
Dr A. Gopalakrishnan, Director, ICAR-Central Marine Fisheries Research Institute, Kochi and Guest of Honour gave a presentation on 'Impact of COVID-19 on marine fisheries and mariculture: an assessment'. Beginning with 'How COVID-19 pandemic unfolded in India', Dr Gopalakrishnan nicely discussed about fish landing that declined entirely in April and May 2020; fish catch decreased by 95% during lockdown and continue to be lower even now; 68% reduction in marine fish catch over previous year as in August 2020; estimated loss in efforts, marine fish landings, landing centre and retail centre value realization of retail fish landings due to complete lockdown in first 40 days of this period in different states; loss in wage income from employment for active marine fishers and fish workers in fish value chain. He further mentioned that lockdown resulted in stranding of about 95000nos migrant fishers all across the coast; workers in pre-processing and processing plants in seafood export severely affected; discussed about minus and plus points (mixed impacts) of COVID-19 upon 3200 mariculture finfish cages in coastal and open sea farms and 8700 seaweed rafts; decline in seafood exports during April-October 2020; new marketing channels and business linkages that emerged during this period – online fish supplying portals came in centre stage; fishermen started direct sales bypassing the markets in several states; rapid emergence of online fish marketing platforms; opening of several organized fish retail shops in this period, with better facilities and focusing on hygiene and sanitation.

As three panelists in this Webinar, Mr V. Ramachandra Raju, President, Society for Indian Fisheries and Aquaculture, Hyderabad gave a presentation on 'Aquaculture through COVID-19 and after' under Mission Blue Revolution; Sri M. V. S. Nagireddy, Vice-Chairman, Andhra Pradesh State Agriculture Mission spoke on 'Impact of COVID-19 on agriculture and aquaculture of AP' and Prof. P. Haribabu, Head, Dept of Aquatic Animal Health Management, College of Fishery Science, Muthukur gave a presentation on 'Status of Litopenaeus vannemei farming during COVID-19 pandemic'. Dr R. Rathod, Sr. Scientist, RRC of CIFA, Vijayawada gave an overview presentation on 'Pradhan Mantri Matsya Sampada Yojana 2020-2025'. Dr S. K. Swain, Director, CIFA and Convener of this Webinar in his concluding remarks spoke about happiness expressed by participants in Webinar, with so informative, helpful and enriching deliberations; highlighted some activities done by CIFA during COVID-19 pandemic that will help fish farmers and to get connected with; virtual platform that enabled CIFA scientists to come closure with fisherfolk and fish farmers in India and also with stalwarts in Indian fisheries and aquaculture during COVID-19 pandemic, some Webinars had been organized; Action Plan for ornamental fisheries in India (under final preparation). This Webinar was nicely coordinated by Dr B. Seshagiri, Principal Scientist and OIC of RRC of CIFA, Vijaywada and Webinar Convener. News communicator Subrato Ghosh listened to all presentations attentively just on next day.

MPEDA launches India's first Aquaculture farmers Call Centre in Vijayawada

Aquaculture farmers can call for guidance 24x7 on toll-free number 1800-425-4648

Vijayawada, December 16, 2020: In a first of its kind initiative, the Marine Products Export Development Authority (MPEDA) has launched a multilingual call centre for aquaculture farmers at Vijayawada in Andhra Pradesh, which will address their technical issues and impart knowledge about efficient farming methods by domain experts round the clock.



K. S. Srinivas, Chairman, MPEDA

Launching the call centre through video conference on 15 December 2020, MPEDA Chairman Mr K. S. Srinivas said it would help the aquafarmers in Andhra Pradesh to seek advice by experienced experts for addressing their concerns and following Best Management Practices (BMPs) to boost production and ensure quality of the produce.

"I request the aquafarmers to make use of the toll-free number 1800-425-4648 with IVRS (interactive voice response system) facility established at Vijayawada to clear their technical doubts from the experts and not to fall in the trap of quacks. It will also help them in seeking information about various support schemes extended by the field offices of MPEDA," he added.

The call centre is primarily aimed to cater to the aquafarmers of Andhra Pradesh, the state that contributes more than 60 per cent of marine products export basket. However, it can also handle calls in English and Hindi.

India produced 7,47,111 MT of shrimps last year (2019-2020), of which more than 68 per cent had come from Andhra Pradesh alone from its over 52,000 shrimp farms covering a water spread area of 75,000 Ha.

"Viewed in this context, it demonstrates the enormous importance of the call centre in the state," the MPEDA chairman noted. "It also underlines the fact that MPEDA has remained at the forefront in taking up initiatives to augment seafood exports from the country by extending all possible help to farmers."

In his welcome address, MPEDA Director Dr Karthikeyan said the small-scale aquaculture farmers are encountering problems in getting proper guidance and technical support, especially during the culture period of farming. "It forces them to seek advice from inexperienced consultants and feed/ input suppliers who hold sway over majority of small aquaculture farms. This often leads to crop failures and quality issues," he pointed out.

MPEDA Aqua Farmers Call Centre opened at its Vijayawada office

Kanna Babu, Commissioner of Fisheries, Govt of Andhra Pradesh

"The call centre will assist the aquaculture farmers of Andhra Pradesh in dealing with the issues of day-to-day farming activities and provide useful aquaculture-related information which can be utilised efficiently," he added.

Appreciating MPEDA for its unique initiative, Mr Kanna Babu, Commissioner of Fisheries, Govt. of Andhra Pradesh, assured full support of the state government in this regard.

Dr U. Jogi Ananda Varma, Member, MPEDA, exuded confidence that the services offered by the call centre would help the farmers to manage their crops in a better way and give a fillip to the Atmanirbhar Bharat scheme announced by the Prime Minister.

Dr Karthikeyan, Director, MPEDA

Mr V. Bala Subramanian, General Secretary, Prawn Farmers Federation of India, members of National Centre for Sustainable Aquaculture (NaCSA) and other stakeholders also took part in the function held distantly.

Mr K. Sivarajan, Deputy Director, MPEDA Regional Division, Vijayawada, proposed a vote of thanks.

Seen along with MPEDA Chairman K. S. Srinivas are Dr M. Karthikeyan, Director, MPEDA, Dr S. Kandan, Project Director, RGCA, Sirkazhi, Tamil Nadu, K. Sivarajan, Deputy Director, Regional Division, MPEDA, Vijayawada and other officials of MPEDA, Vijayawada and RGCA.

MPEDA Starts Mud Crab Demonstration in Farmers' Pond in Nirmala Nagar, Guntur District

Crablets stocking in farmer's pond on 06 November 2020. Galidevudu, Asst. Director of Fisheries, B. Appala Naidu, APM, RGCA, Dr P. Sankar Rao, Joint Director of Fisheries, K. Sivarajan, Deputy Director, MPEDA and R. A. Gupta, Deputy Director are seen from left to right

MPEDA , Regional Division, Vijayawada has stocked crablets in the aquaculture pond of Water Spread Area 0.50 Ha of a beneficiary Mr Rajsekhar V, belonging to scheduled Tribe at Nirmala Nagar Village, Repalle Mandal, Guntur district. 3,000 crablets of size 1.6-3.0 CM were stocked in pond on 06 November 2020 by MPEDA Officers along with Dr P. Sankar Rao, Joint Director of Fisheries, Government of Andhra Pradesh. Mr K. Sivarajan, Deputy Director, MPEDA, Vijayawada informed that the crablets are now stocked in the nursery pen of the pond will be released to the same pond after 2 months nursery rearing. The total culture period will be around 6 to 8 months for attaining Average Body Weight of 500 to 1000 gms size. He informed that MPEDA is planning to organise similar demonstrations in various diversified species in other districts also. And hence interested farmers can submit their application. The Joint Director of Fisheries informed that MPEDA is doing great service to the nation and also involved in upliftment of poor farmers and socially and financially backward classes through extension programmes, trainings, demonstrations, subsidy assistances etc. Mr Pandyarajan, Assistant Director, MPEDA,

Crablets segregation, acclimatization and stocking

Nagapattinam assisted in supervision of crablets stocking in the pond. Mr R. A. Gupta, Deputy Director, MPEDA, Mr Appala Naidu, Assistant Project Manager, RGCA, Manikonda, Mr Galidevudu, Assistant Director of Fisheries and other officers as well as some farmers also witnessed the stocking Programme.

MPEDA Organises 5 Days Training Programme for Scheduled Tribe Beneficiaries

Bhanukoti. G, Ex. MPP inaugurating the SC/ST Training Programme, K. Sivarajan, MPEDA, Deputy Director, Vijayawada Region Ms Likhitasri and Ramaraju, Field Manager, NaCSA are also seen.

MPEDA conducted five days training programme for the benefit of 15 scheduled tribe beneficiaries of Nirmala Nagar, Tummala, Repalle Mandal, Guntur district, Andhra Pradesh, from 3 - 7 November 2020.

Bhanukoti. G, Ex.MPP giving inaugural address. Ramaraju, Field Manager, NaCSA, K. Sivarajan, Deputy Director, MPEDA and Venkateswarlu, President, ST Forum, Nirmala Nagar are also seen from left to right.

The programme started with a Covid-19 pledge in Telugu administered by Mr K. Sivarajan, Deputy Director, MPEDA, Regional Division, Vijayawada. Mr G. Bhanukoti, Ex. MPP inaugurated the training programme on 3 November 2020. In his inaugural address, Mr Bhanukoti, Ex. Mandal Parishad President briefed about aquaculture in Repalle Mandal and thanked MPEDA for its developmental activities in aquaculture sector.

Mr K. Sivarajan, Deputy Director, MPEDA in his welcome address, briefed about MPEDA's farm promotional activities, and issues of low production or non-operation of farms in certain areas due to lack of proper infrastructural facilities, financial constraints and lack of scientific approach in aquaculture. He informed that there are more than 300 acres of Brackishwater aquaculture farms in Nirmala Nagar Village itself owned by around 110 families of Scheduled Tribes. However, the area is not properly utilised for aquaculture as there is no electric supply to operate pump and aerators. The farmers stock some shrimp seed, however they miserably fail in every crop. He told that this is the reason why we identified a site of Scheduled Tribe

A view of Training classes

category for a scientific demonstration of mud crab farming in Nirmala Nagar. He told that this demonstration, training and the farmers meet being conducted in three days will surely have positive impact in farming sector in Guntur district.

Mr Ramaraju, Field Manager, NaCSA and Mr Venkateswarlu, President, Scheduled Caste Forum facilitated the inaugural function. Mr Swadeep, Field Technical Officer, MPEDA extended vote of thanks.

The classes on Introduction to shrimp farming, types of farming and present status and scope for Shrimp Farming in Andhra Pradesh, Site selection, Preparation of layout / Design and construction of shrimp farm, Machinery and equipments in shrimp farming, Biology and Life Cycle of Shrimp & Hatchery Production of shrimp seed, Pond preparation and Management of Aquaculture Farms, Seed selection, acclimatization and stocking, Feed Selection & management in shrimp farms, Soil & Water quality management in shrimp farms, Trouble shooting for the problems noticed in shrimp farms & Better Management Practices for successful shrimp farming, Disease management in shrimp farming and Prevention and Control of emerging diseases, Growth monitoring and stock assessment in shrimp farms, Harvest, Post harvest handling & Marketing of shrimp and comparison of economics in P. Monodon, L. Vannamei shrimp & major carp fish farming, All about scientific GIFT Aquaculture, Formation of Aquaculture Societies & Schemes of NaCSA, Enrolment of aquaculture farms and shrimp Hatcheries, Antibiotic issues & RASFF Rejections in Indian aquaculture & need for record keeping in aquaculture, Scientific Seabass Farming in Pond & Open waters / Cages, Freshwater Prawn (Scampi) farming, Introduction to Mud crab culture, pond preparation, hideout making and seed stocking, Diversification in aquaculture, Crab culture - Feed preparation for nursery and grow-out culture, sampling, feed calculation and feeding, water quality assessment, preparation of grow-out culture pond and pen culture pond, Crab culture – harvesting of crabs, grading, stock assessment, stocking and harvesting, marketing and economics, antibiotic issues, farm enrolment & GIS mapping etc were handled by officers from MPEDA, Vijayawada, NaCSA, Fisheries department, RGCA, MPEDA, Nagapattinam etc Mr K. Sivarajan, Deputy Director,

Mr Pandiarajan, Assistant Director, Mr Appala Naidu, APM, RGCA, Mr Srinivas Rao, APM, RGCA, Mr Brahmeswara Rao, Technical Expert (Call Centre), Mr R. A. Gupta, Deputy Director, MPEDA, Mr Godi Ramraj, Field Manager, NaCSA, Mr Venkata Ramana, Regional Coordinator, NaCSA, Mr Arivukkarasu, Assistant Director, MPEDA, Mr Swadeep, Field Technical Officer etc engaged classes.

In the valedictory function on completion of training on 7 November 2020, stipend and certificates were distributed to the trainees.

Global animal nutrition major, Trouw Nutrition, foray into India with a state-of-the-art facility in Telangana

Invests in a modern plant at Jadcherla near Hyderabad, to address market needs of South Asia

Hyderabad, December 2020: Trouw Nutrition - a Netherland based Nutreco company, announced its maiden manufacturing foray in India with a state-of-the-art production facility at Jadcherla near Hyderabad, today. Nutreco, through its two reputed brands, Trouw Nutrition and Skretting, is a global leader in animal and aqua nutrition, bringing innovative feed additives, premixes and nutritional services. It is the animal nutrition division of the 125 year old Dutch family owned SHV Holdings. SHV has interests in energy, retail, heavy engineering and investments and clocked sales of €19.2 billion in 2019, from its global operations.

The facility has high-end technology designed to deliver superior quality premix for customers in South Asia. The 20,000 MT modern plant will primarily produce vitamins, mineral premixes, mineral blends and feed safety solutions for all species. The company's unique 'Nutrace' programme, a food safety and quality initiative of Nutreco, ensures end-to-end quality and traceability, with added emphasis on feed-to-food safety. The entire manufacturing process is automated right from raw material handling to bagging at the plant so that the final product is completely untouched by hands. The unit will cater to the market needs of the entire South Asia and is expected to clock full capacity utilisation by 2025.

Dr Saurabh Shekhar, Managing Director, South Asia, Nutreco

Jurrien Zandbergen, Managing Director, Nutreco, Asia

This production facility enables us to contribute our bit to the prestigious – Atmanirbhar Bharat - Make in India initiative, while simultaneously improving the efficiencies with lesser turnaround time and better customizations as per customer's needs. Telangana was an apt choice considering its easy accessibility and being an investor friendly state. Even from market perspective, it's a major poultry and aqua belt with logistical access to good ports, says Dr Saurabh Shekhar, Managing Director - South Asia, Nutreco.

We are also coming up with a facility at Surat for aqua feeds, which will be commissioned by 2021 or 2022. The Jadcherla factory is on a four acres land and the Surat facility will be on 6 acres. The Jadcherla facility will primarily cater to India first and later to the markets of Bangladesh, Nepal and Sri Lanka.

Trouw Nutrition is currently present in over 175 locations globally with 70+ manufacturing facilities. It caters to the entire value chain of livestock business, with product mix encompassing feed additives, premixes, feed, meat processing, farm minerals, milk replacers and pet food. Nutreco started its operations in India in 2013 and has aggressively ramped up operations since 2017 to expand the footprint in the South Asian markets.

Asia and India are key to achieving our mission of Feeding the Future. We already have plants in

Trouw Nutrition's, state-of-the-art production facility at Jedcherla near Hyderabad

(Top-Bottom) Dr Saurabh Shekhar, Managing Director, South Asia, Nutreco and Jurrien Zandbergen, Managing Director, Nutreco, Asia; briefing media about Trouw Nutrition's global leaders in animal nutrition, maiden manufacturing foray in India with a state-of-the-art production facility at Jedcherla near Hyderabad, at a virtual press conference.

Japan, China, Indonesia, Vietnam and Myanmar, to strengthen our presence in Asia. Establishing a state-of-the-art production facility at Jadcherla, Hyderabad, is our way of reinforcing commitment to South Asia and Indian markets.

This is just the beginning in our long voyage to gain a strong foothold here, says Mr Jurriën Zandbergen, Managing Director, Nutreco, Asia. Our investment in both the facilities in India is 20mn Euros, this doesn't include the investment we are making in start-ups. We are also looking at partnerships and acquisitions to grow. We are on a continuous lookout for opportunities for investments, we are in talks with other start-ups too in the domain of livestock industry and animal nutrition, for investment.

Nutreco has both organic and inorganic growth plans to expand its footprints in South Asia. Though currently the company's thrust is on B2B segment, the next steps are to foray into B2F segment. NuFrontiers, the investment arm of Nutreco, has invested strategically in start-ups globally, including the Internet of Things (IoT) enterprise, Eruvaka in India for innovations in aquaculture. These initiatives will leverage the strengths, streamline long-term strategies and position the Company firmly to take on the challenges ahead in the animal and aqua production domain. In fact Eruvaka a Vijayawada based start-up helps in enhancing freshwater fishing substantially, we saw good results in India from this solution and took it globally, the most successful application of this is in Ecuador, where Eruvaka is helping farmers to increase their productivity.

Trouw Nutrition's, state-of-the-art production facility at Jedcherla near Hyderabad, India

In India, the facility allows us to aggressively diversify and cater to all species like poultry, dairy, aqua and pets. Our initiatives will remain focused to provide responsible, cost-effective solutions to our customers and progressive farmers, says Dr Saurabh Shekhar. We see huge potential in this market, India is one of the fastest growing markets, the average global growth of dairy market is 1 to 2% while India is expected to grow by 5 to 7%; similarly egg production global growth would be 2 to 3% while India is likely to 5 to 7%; broiler meat may say 2% growth globally but in India around 3 to 4% is expected.

Trouw is adopting a seamless integrated solution approach in India by focusing on innovative technologies like Mycomaster, NutriOpt On-site Adviser (NOA), along with a dedicated Customer Service Laboratory, MasterLab at Hyderabad. The digital platform, NutriOpt On-site Adviser (NOA), helps in accurate nutrient analysis to achieve precision nutrition goals of farmers and feed millers, while Mycomaster provides quick analysis of mycotoxins to enable quick decision making by customers. MasterLab, which is the largest chain of customer service laboratories in animal nutrition industry, conducts varied analytical assays for complete feed, raw materials and water, using state-of-the-art equipment, modern techniques and highly qualified laboratory technicians.

Being an integrated solution provider, we have a combination of Products, Services, People and Models for the major challenges being faced by livestock industry today, like responsible usage of antibiotics, feed safety, mycotoxin and Salmonella challenge and optimum mineral nutrition to increase animal productivity and help farmers double their income. Our expertise of 90 years and continuous strive for innovation and research combined with customer-centricity helps us to bring practical solutions for our customers, adds Mr Jurriën Zandbergen.

About Trouw Nutrition

Trouw Nutrition is the global leader in innovative feed additives, premixes and nutritional services for the animal nutrition industry. We provide products, models and services to boost productivity and support animal health through all life stages. With unique, species-specific solutions, Trouw Nutrition has been meeting the needs of farmers and home-mixers, feed producers, integrators and distributors since 1931. We make it our business to understand the true challenges being faced by farmers and integrators in the animal nutrition industry. Innovation, research and collaboration drives our commitment for sustainable nutritional solutions.

Trouw Nutrition is a part of Nutreco company, the animal nutrition division of SHV. SHV based in Utrecht, the Netherlands has a wide range of operations and presence in 52 countries with more than 60,000 employees and a net sale of € 19.2 billion.

CIFRI holds online Training on fish farming in cages in reservoirs and wetlands

The online training entitled 'Production enhancement through cage culture in inland open waters' ('Jaladhar mein cage culture maddhyam ke dwara matsya utpadan briddhi') was organized by ICAR-Central Inland Fisheries Research Institute, Barrackpore on December 11, 2020 in Hindi language. Dr A. K. Das, Principal Scientist (PS), CIFRI gave a comprehensive presentation and explanation on 'Different types of cages and their production efficiency & management'. He discussed that ICAR has given much emphasis on cage and pen enclosure culture in inland open waters in this institute, which will boost protein food supply, improve social health and livelihoods; stated 'Agriculture sector mein antardesiyon matsyayiki ki pragati kaafi huyee hain'. India has 35.17 and 8.2 lakh hectare of reservoirs and floodplain wetlands respectively; 0.1% area of each of large (more than 5000ha) and medium (1000-5000 ha) reservoirs with water depth above 8mt been selected and utilized for cage culture. Country's fish production was 134.46 lakh tonnes in 2018-2019, about 137 lakh tonnes in 2019-2020 and we aim to achieve more.

Chandil Dam in Jharkhand (Jh) is significant eye opener of advancement made by Jh in cage fish culture in last 10 years. Local community (population) depends upon cage fish farming and production for their living, who could be involved in this system. Cages installed in country's largest Indira sagar reservoir in Madhya Pradesh (MP), will be done in Bakreswar reservoir in Birbhum, WB. Deep-water barrages like Tilpara in WB are good sites for profitable cage fish farming. Concept of enclosures cages and pens were pictorially explained, also structures of simple floating cage with bamboo-based frames, sinkers and drum-floats (CIFRI technology) applicable in deeper waters in rural India which gained international recognition. Mosquito net material or netlon hapa used for raising fingerlings of IMC, exotic carps, Labeo bata and/ or raising table fish. MP, Telangana have advanced in cage culture; Jh has 1,20,000ha reservoir where more cages can be installed and utilized for fish culture.

Deeper floodplain wetlands in eastern Uttar Pradesh (UP), Bihar, Assam, Manipur with water depth above 4mt provide opportunities for cage culture. Circular cages found to give more fish production (highest) compared to rectangular/ square cages of same volume, which increases when angles in structure is less. In Hirakud reservoir, cages of even 1000cubmt volume installed by CIFRI. Smaller the cage area, more is production as flushing occurs more and effectively. About 2700nos of coliary pits (koila-khadan) in Jh lying empty, with no pollutants, where CIFRI encouraged local women-led SHGs in cage culture with support of Jh Fisheries Dept. Structures of fixed cage (inbuilt component of pisciculture, even in-vogue), circular submersible cage (with steel frame), floating cage as installed in Dahud reservoir, MP were shown. Rectangular simple submerged cages for deeper ponds and wetlands are less used now. More than 20000nos cages are in operation in India for fish farming. Cage culture is a call for Blue Revolution and Dr Das said: 'Cage culture ka bahut mahatya hain PMMSY mein'.

CIFRI started demonstration of economically-important table fish production through galvanized iron (GI)-based cages in Maithon reservoir and elsewhere from 2011 onwards; same was commercialized in 2016-2017 and patented in 2018-2019. Dr Das showed model of already-marketed CIFRI model GI frame cage, having durability above 25 years and high resale value. Cage culture demonstrations extended to Ukai and Wadhwana reservoirs, Gujarat; Samaguri deep beel, Assam; Krishnagiri reservoir, Tamil Nadu; Loni wetland, UP (proposed site); Salia reservoir, Odisha; Chandil in Jh for Pangas catfish culture; Govindsagar and Pong reservoirs, Himachal Pradesh (water T below 24°C round the year); Dumbu reservoir, Tripura. Advantages and disadvantages of low-cost cage, GI cage and HDPE/ Pontoon-based cages were discussed. Increasing carp fingerling production for reservoirs is a good initiative in cages; 50% of fingerling requirement for stocking herein can be cage-produced, no transportation required. Many trainings conducted for youths from different states on cage culture and means of increasing fish production at Maithon. CIFRI did experiments on stocking fingerlings of major carps, L. bata, air-breathing catfishes, Scampi in cages and rearing till table size; 50-100gm advanced carp fingerlings in circular cages in Hirakud attained 1kg or above in 4-5 months.

Minor carp Barbus gonionotus fingerlings, if stocked @ 5-10nos/cage, graze upon periphytic growth on inner walls of net screen and clean it up, clearing blockage and facilitating freshwater flow through net meshes. CIFRI marketed and provided technology packages of practices on raising carp fingerlings (monoculture and mixed-species culture) from fry and production of table-size major carps, air-breathing fishes and Pangas catfish (grow-out culture) to farmers. Integration of duckery with pisciculture possible in 1-2 cages in reservoir. At Kabini reservoir, Karnataka, cage frame made from locally-available areca nut trees. Modular and quite expensive Potoon cage installed at Pong reservoir,

HP. Women empowerment done at Sidhibari village, Asansol, WB through adoption of CIFRI cage and fish culture, cage culture with ecotourism developed at Tilaiya dam, Koderma with on-field training to fishers. Dr Das focused on steps to prevent feed wastage and its coming out from cage net enclosure, CIFRI's new model low cost round cage in FRP enclosure (world's most low cost fish cage) about to be launched, demonstration activities conducted by CIFRI for fishers, entrepreneurs, PG fishery students, State Department officials and NGOs across India on cage culture. He highlighted the scientific understanding and all afore-mentioned facts on subject's concept and advancement very lucidly.

Dr G. Karnatak, Scientist, CIFRI gave a presentation entitled 'Pangasius culture in cages', a high-demand fish. Dr M. A. Hassan, PS of this institute in his overview presentation emphasized on details of feed preparation for fishes reared in cages, feeding and feed management, home-made fish feed formulation with necessary ingredients. Dr R. Baitha, Scientist spoke on 'Fish health management in cages'. He pictorially discussed about symptoms of different bacterial and other diseases observed in growing fishes in cages and their control measures. Mixture of 200-250gm KMnO4 mixed with mud (neither hard nor soft), making up 1.0-1.5kg balls, can be placed inside cages, one in each, which clears pathogenic organisms from water mass inside cages. Fishes infected with bacteria and other pathogens can be treated with approved antibiotics only, added to supplementary feed at recommended dosage, Dr Baitha mentioned. Finally Dr (Mrs) A. Roy, Scientist of this institute briefly informed and awared participants on-line about 'sujog-subidha' of Pradhan Mantri Matsya Sampad Yojana (PMMSY) scheme, launched by Ministry of Fisheries, Govt of India in 2019. PMMSY is biggest yojana introduced in fisheries sector in post-independence India; Rs 20050 crore invested for 'Unnayan in Matsyayiki kshetra aur matsyasampad utpadan ki briddhi'. Professional fish farmers and fishermen in different avenues of fisheries and aquaculture, members of men and women-led SHGs directly involved with two sectors, young entrepreneurs willing to get involved in cage culture and other disciplines of fish farming in well-managed ponds, indoor tanks and inland open waters, members of primary fishermen cooperative societies, social entrepreneurs will be benefitted from this scheme. Progressive fish farmers, fishers, aqua-entrepreneurs, teachers from State Fisheries Colleges from Jh, MP, Bihar, UP, Maharashtra participated in this one-day online training; News communicator Subrato Ghosh was there as a learner like them.

Online Training Programme on Traditional and Alternative Fish Feed Ingredients

The Online training-cum-awareness programme entitled 'Traditional and Alternative Fish Feed Ingredients' was organized by Kolkata Centre of ICAR-Central Institute of Fisheries Education on 26 December 2020. This theme of programme, organized under PMMSY, is one of broader area of the subject 'Fish feed and feeding strategy'. Dr S. N. Ojha, Principal Scientist (PS), ICAR-CIFE, Mumbai in his talk spoke about need of officials at Department of Fisheries and scientists in research institutions working jointly to implement fishery projects under PMMSY successfully; benefits that aqua-entrepreneurs may get; that WHO recommended fish as immunity-boosting food in COVID-19 times. Establishing online field school, we can progress forward in aquaculture extension; cluster-based group ('Sangathan') each comprising 20 fish farmers/fishermen can be organized and to whom newer technologies disseminated. Five of them (members) can be trained to become 'specialized' in responsible leading activities in group, who will become Governing Body members once FPO is formed (upgraded from group). Lectures can be organized locally, one guide will consult experts to solve doubts/problems of members and scientists will receive feedback from them. Project/proposal on setting up of fish feed mill, ornamental fishery or others under PMMSY may be prepared by group/FPO. While explaining this concept, Dr Ojha also discussed about unit cost and Government assistance (subsidy) pattern in PMMSY for setting up fish feed mill of four different production capacities and how beneficiaries can submit DPR properly. He urged participating fish farmers/entrepreneurs in this programme to form 'Sangathan', who will receive technical guidance from scientists.

Dr N. P. Sahu, PS, Fish Nutrition & Biochemistry Division, CIFE spoke on 'Leaf meal as alternative to deoiled rice bran (DORB) in carp feed'. He discussed about how to make change approach in conventionally-used DORB as fish feed ingredient so that fish production goes high and input cost lowered, low-cost protein rich feed preparation to maximize profit. DORB used by 60% or above fish farmers in India as fish feed ingredient, 30 – 40 % of it is used in feed. Profit can be increased if DORB (whose production and availability expected to be lesser, that will not increase in future, with increasing price) is replaced by about 20% by less-costlier leaf meal in feed. Dr Sahu elaborately discussed

about experimental studies on some kinds of leaf meal used in fish feed. If boiled DORB is used instead of raw one (direct use), nutrient utilization for fish becomes better. Solid state fermentation of DORB with fungus and supplementation of deficient nutrients in it with exogenous commercially-available enzymes and amino acids (EAA) may cause fish production increase; beneficial effects of DORB increases without increase in feed cost. Lysine content in fermented DORB increases to 12.57 units from 2.81 (in DORB); two-fold protein increase observed with reduction in anti-nutritional factors. Means to remove ANFs from rice bran was discussed. Berseem leaf meal expected to be better than DORB as fish feed ingredient.

Supplementation of enzymes and EAA with DORB leads to decrease in cost to produce 1kg fish by Rs 10-15/-, Dr Sahu explained. Crude protein content of screened leaves that can be used as feed ingredient, viz., that of groundnut, subabul, black gram (lentil), gokulakanta (weed), corn mint (oil-extracted mentha), sweet potato, lemon grass, Siam weed (in Kerala), green pea, Arhar pulses, soyabean, dhanicha, Berseem, cauliflower and its leaf protein concentrate, was discussed. Normally DORB is used by 30% in feed; groundnut leaves and Gokulakanta can have 100% replacement to DORB. Results of experimental studies on efficacy observed of each of these leaves as fish feed ingredient, percentage of its inclusion in feed and percentage of their replacement to DORB individually giving highest and better efficacy among different treatments of each of them in terms of weight gained by Rohu fingerlings in comparison to control feed, were discussed with bar graphs. Soyabean, groundnut, Arhar laves can be obtained after harvest of crop; all kinds of leaves to be used in dried and powdered form. Efficacies of Berseem leaf meal with nano-encapsulated nutrients over DORB, mixed leaf meal (mung, Ipomoea and Gokulakanta equally) with EAA added, were discussed. Dr Sahu showed home-made simple model of fermenter-cum-mixer for fish feed; 96 hours fermentation of DORB before use can cause 20% increase in fish growth and production compared to raw DORB. Mixing of leaves for preparing fish feed can ensure their availability throughout the year and fish farmers can increase their production if simple techniques are adopted, Dr Sahu concluded.

Dr G. H. Pailan, PS, Kolkata Centre of CIFE spoke on 'Traditional and alternative fish feed ingredients'. While discussing on world and India's fish production trend via capture fisheries and aquaculture and about need of increasing fish productivity (per unit production) in ponds, Dr Pailan spoke about alternative fish feed ingredients that are less costlier; emphasized on fish quantity enhancement as well as enhancing quality nutrition. Importance of liming and fertilization in fish ponds and management interventions; good quality fish seed, well-maintained environment and balanced feed as factors influencing fish production; aquaculture practices in relation to inputs; importance of both energy supplements (protein-rich and energy-rich) and non-energy yielding supplements as feed ingredients; criteria of their selection (emphasizing on locally-available ones, their freshness, moisture content); preparing economic fish feed with less use of fish meal - all these aspects were comprehensively discussed.

In continuation to it, Dr Pailan described protein content, availability in different states and other features of plant-based protein-rich conventional fish feed ingredients, viz., soyabean oilcake, mustard oilcake, decorticated GNOC, sesame/til oilcake, sunflower oilcake, cottonseed oilcake, linseed oilcake, corn-gluten meal, less-used coconut oilcake and palm kernel meal (being more fibrous); features of conventional animal protein-rich fish feed ingredients , viz., fish meal (with balanced EAA), meat meal, meat-cum-bone meal, shrimp meal, shrimp head meal (from processing plants), squid meal, crab meal; features of energy-rich fish feed ingredients, viz., corn flour free from fungus, wheat flour, broken rice, oats, millets, barley (all as grains) and rice bran and wheat bran (as mill by-products). Dr Pailan discussed about PUFA content of different fish oils and vegetable oils (in gm/100gm of edible protein); that inclusion of essential PUFA-rich oils in feed of brooder major carps by 1.0-1.5% leads to proper gonadal development of broodfishes and early breeding can be accomplished in a season.

Features of unconventional fish feed ingredients, viz., blood meal, fish soluble, poultry feather meal, poultry by-product meal, silkworm pupae meal, dried and pelleted Azolla meal, brewer grain meal, dried earthworm meal, casein, dried whey, single cell protein (last three as larval feed), fruit processing waste; fish farmers must use Vitamin-mineral mixture available in markets @ 1-2% in fish feed; ingredients that are used for mineral pre-mix; additives (binders of different kinds, antioxidants to increase shelf life of feed, Vitamin E); preservatives (0.10-0.25% in feed); amino acids as attractants – all aspects were nicely discussed by Dr Pailan. Towards the end, he spoke about some ANFs present in unconventional plant ingredients that must be processed, ANFs removed and detoxified; same removed in soyabean meal when roasted. Dr Pailan opined that fish farmers must have knowledge about important ingredients used in fish feed formulation, ingredients that are locally-available, nutritive value present in them individually, their digestibility, market price – then those ingredients can be selected and fish feed prepared, which will be economical and lead to increase in fish production. Knowledge about feed formulation has to be spread to Indian fish farmers, with a thought towards acceptance pattern of farmers. Farm-made fish feeds will lead to fish productivity enhancement and have lesser cost compared to industrially-manufactured feed; nutritive quality of the former will be guaranteed as known ingredients mixed in known quantity. It was overall a very informative and educative programme; News communicator Subrato Ghosh was a registered participant in it.

India produces 63 billion shrimp seed with 550 hatcheries

AISHA – TN Region holds its AGM; Present body to continue two more years. AISHA to play a positive role for the industry.

Muthukaruppan lighting the lamp as other members are seen watching

Chennai: The Tamil Nadu Region chapter of All India Shrimp Hatcheries Association (AISHA) organised its Annual General Body Meeting - 2020 on December 18 at Hotel Ocean Spray, Manjakuppam, East Coast Road, near Pondicherry. A large number of hatcheries in Tamil Nadu region and other stakeholders of aquaculture sector took part in the meeting.

Mr D. Ramraj, National President of All India Shrimp Hatcheries Association (AISHA) said that licensing policy in aquaculture sector by the government should be made simple and views of the stakeholders of the industry should be taken into consideration before finalising the policies. We are supposed to sell shrimp seed to licensed farmers, but it is not happening. India has 550 hatcheries with a production capacity of 120 billion seed, whereas they are producing 60 billion seed annually. We have sufficient size of broodstock to produce quality seed, he stated adding that AISHA will play a positive role for the industry.

He complimented Tamil Nadu Region hatcheries that they have more vibrant body working for the wellbeing of the segment.

Create zones for seed production

Dr Joshi K. Shankar, President, AISHA - Tamil Nadu Region said that aquaculture sector was escaped from Covid-19 pandemic than other industries in India. AISHA had put efforts along with fisheries department officials in Tamil Nadu state to provide essential inputs and services for the production of seed by hatcheries to the farmers. He thanked the fisheries department officials for the timely support. He explained that hatcheries faced problems from the local people and the fisherman community due to which many hatcheries suffered during lockdown owing to Covid-19 pandemic.

Dr Joshi K. Shankar, President, AISHA – TN Region

G. Calraj, Secretary, AISHA - TN Region

Dr K. Jagadeesan, Treasurer, AISHA – TN Region

John M. John, Managing Partner, Matha Hatcheries Group, M. A. Nazeer, Editor, Aqua International and other participants.

G. Calraj, Secretary, AISHA – TN Region reading annual report

Dr Joshi K. Shankar felicitating Madhusudan Reddy. G. Calraj is also seen

Dr Joshi underlined the need of creating zones for hatcheries in the production of seed in the country, he said, year 2020 concluded with better seed prices and hoped 2021 will be still a better year to aquaculture sector in the country.

The AGM passed a resolution that the present office bearers of AISHA, Tamil Nadu Region should continue for the next two years.

Mr K. Madhusudan Reddy, Secretary, AISHA also spoke on the occasion.

Dr P. E. Cheran, Vice President, AISHA – Tamil Nadu Region welcomed. Mr G. Calraj, Secretary read the annual report of the association. Dr K. Jagadeesan, Treasurer gave vote of thanks.

Regional Office opened at Kalpakkam

AISHA Tamil Nadu Region has 85 hatcheries as its members producing five (5) billion shrimp seed annually, and supplying the seed all over India. It has opened its regional office at Kalpakkam on East Coast road near Chennai. In 2003 there were only 10 hatcheries in Tamil Nadu region and has presently grown up to 85 hatcheries.

From left: Dr P. E. Cheran, K. Madhusudan Reddy, D. Ramraj, Dr Joshi K. Shankar, G. Calraj and Dr K. Jagadeesan during AISHA – TN AGM 2020 at Manjakuppam, East Coast Road, near Pondicherry on December 18.

RAS@EAS: A new element of the EAS Aquaculture Europe events

The European Aquaculture Society AE 2020 event is taking place online next April 13 - 15

On April 12 (Before the conference starts the following day)EAS is organising a full day 'special' event RAS@EAS. To complement the science presented in the parallel sessions of the AE conference, RAS@EAS looks to take a different approach - with the emphasis on bringing together key figures from science and industry to focus on key issues, present the latest knowledge and share experience with different species and systems.

The first RAS@EAS event is entitled "Creating an Optimal Environment"and 3 panel discussions will address key questions related to this:

- Session 1: How do we best approach disinfection? (Moderated by Jaap van Rijn of The Inter university Institute for Marine Sciences in Eilat (IUI), Israel and with introductory presentation by Chris Good of the The Conservation Fund Freshwater Institute, USA.)
- Session 2: Where are we going with monitoring & autonomy? (Moderated by ØyvindFylling-Jensen of Nofima, Norway and with introductory presentation by BårdSkjelstad of Scale AQ, Norway.)
- Session 3: What are the most challenging interactions between fish & RAS environment? (Moderated by Damien Toner of Bord Iascaigh Mhara (BIM), Ireland and with introductory presentation by Jelena Kolarevic of UiT The Arctic University of Norway/ Nofima, Norway.)

The flyer and the programme (with profiles of the moderators, speakers and panel lists) is available at the AE2020 web site. Participation in this online event is included in the AE2020 registration and participants can register here.

But interested persons can also register just for the RAS@EAS event. Registration is FREE for EAS members and is €100 for non-members. To register, follow the link above.

To benefit from EAS membership and access RAS@EAS for free, those wishing can join EAS firsthere, or add your EAS membership to your basket when you register for the RAS@EAS event.

The AE 2020 Brochure is at https://aquaeas.org/_pdf/AE2020RegBrochure.pdf

DR. JOSE KUTTY P.A

DR. JOSHI.K.SHANKAR

JAY JAY GROUP OF HATCHERIES

PONDICHERRY

High Quality SPF Vannamei Seeds,
CAA Approved Shrimp hatcheries,
Highly biosecure operations

Our Hatcheries :

- ✯ Calypso Aquatec - Marakkanam, 9443219819
- ✯ Jay Jay Aquatech - Anumanthai, 9894229202
- ✯ Pacific Shrimp Hatchery - Chetti Nagar, 8903752846
- ✯ Jay Jay Gold - Panayur, 9443202245
- ✯ Blue Bay Culture - Azhakankuppam, 8903518624
- ✯ Jay Jay Marine - Nellore, 9701249884

Our Other Activities :

- ✯ Hatchery consultancy services.
- ✯ Farm feed Trading (Purina)
- ✯ Shrimp Farming

Jay Jay Group of Companies

Regd office: No: 13, Aziz Nagar, Reddiarpalayam,Pondicherry

Mob : 9894046172, 9894351122

Email: jayjayaquatech@gmail.com Web: www.jayjayaqua.in

What the Stakeholders said about the industry in 2020 & in the New Year 2021

I see Aquaculture industry in 2021 to prosper better if flood and cyclone do not cause heavy damage

Dr M. Sakthivel, President, Aquaculture Foundation of India says:
My slogan is Healthy Environment for Healthy fish. Healthy fish to sustain our Health.

Aqua International invited stakeholders in Aquaculture sector to send their observations, views and opinion on how the industry was in the just concluded 2020 and how they see the New Year 2021 for the sector. We published views of some stakeholders in this issue and remaining will be published in February 2021 issue of this magazine. Excerpts of the interviews held with the stakeholders through online questionnaire:

Dr M. Sakthivel, President, AFI

Since I am in USA my contacts are not much. My sincere feeling is that you should focus a little more attention on Seaweed cultivation which has immense potential to revolutionize our agriculture in India. In my opinion, Seaweed bio fertilizer alone can be produced in large scale through cultivation in seawater. Surface cultivation is seasonal in many parts of our coast.

Sub-surface cultivation in sunlit upper layer should be tried for large scale cultivation which should be possible to produce seaweed in desired salinity and temperature. From the export of shrimp, I could see our Andhra Pradesh farmers have done their best despite natural disasters.

Performance of fish and crab are not satisfactory since marine fish culture is suffering due to seed production issues. When South East Asian countries could do so well, why not India ?

The work done by CMFRI should be strengthened further. You may request the Director to contribute an article on problems of marine fish culture which will provoke our farmer entrepreneurs.

"Farmers always sell their produce as raw material. I feel necessary infrastructure should be provided for cleaning, auctioning, storing in cold storage and transport. Our fish marketing has to be improved a lot. After catch fish should be handled in cool temperature till it reaches consumers. Our loss due to poor quality will mount to billions of rupees every year. No one bothers about it"

I see Aquaculture industry in 2021 to prosper better if flood and cyclone do not cause heavy damage. I believe that farmers should be supported with insurance at a reduced rate of premium so as to renew the energy and confidence of farmers to continue their Aquaculture farming.

Provide necessary infrastructure

Farmers always sell their produce as raw material. I feel necessary infrastructure should be provided for cleaning, auctioning, storing in cold storage and transport. Our fish marketing has to be improved a lot. After catch fish should be handled in cool temperature till it reaches consumers. Our loss due to poor quality will mount to billions of rupees every year. No one bothers about it.

Value addition is a difficult process

Value addition is a difficult process since consumers want different kinds.

However we must go for primary value addition. That is washing, cleaning and soft handling.

My plan for 2021 is to do something useful to farmers particularly in Andhra Pradesh to rejuvenate aquaculture sector. My sincere feelings are that environment should not be damaged due to gold rush like last time. Therefore, my slogan is Healthy environment for Healthy fish. Healthy fish to sustain our health.

Healthy seaweed products can give adequate energy to reduce malnutrition problem of millions in our country. Awareness creation on untapped potentials of seaweed cultivation in India should be your top priority in Aqua International. If you need any clarification please do not hesitate to send me an email.

Problems and prospects – A broad overview of Aquaculture and Fisheries sector in post pandemic period

- By Arindam Pakrashi, Director, Redoxzon Aqua India Pvt Ltd

Arindam Pakrashi, Director, Redoxzon Aqua India Pvt Ltd

hand it is at a threshold of a quantum jump. Never in the history of Indian fisheries and aquaculture there were so many opportunities and scopes, so much popular enthusiasm and governmental support (PMMSY) and interventions, so much opening of new and uncharted farming areas, so much interest for affordable technological advancement. For the first time the Central Agriculture Department of Government of India has been truncated and separate independent Fisheries and Animal Husbandry Ministry is etched out under an independent Union Minister.

On the other hand, the challenges of maintaining biosecurity and biodiversity, minimising application of antibiotics, arresting the depletion of ground water level, reducing inundation of adjoining agricultural land by saline water in the coastal aquaculture are paramount. The challenges further aggravated with the scientific understanding that in coming year potable water scarcity, global warming and carbon emission will pose major threat to the abundant source of water that the perennial rivers in India have so far catered the Indian populace. The hinterland of the numerous major rivers and their tributaries so far remain the habitation of the fish farmers and fish farming contributed as a major source of livelihood which could face scarcity of water in near future.

Therefore, the primary challenge remains as, how to scale up production within the available limited water bodies with low economic resources.

India is blessed with a coastline of over 8118 km, 2.02 million sq. km of EEZ and 0.5 million sq. km. Varieties of seafood in India include – Fish, Prawns, Lobster, Oysters, Roe, Shellfish, Crustaceans, Shrimp, Molluscs, Echinoderms, Medusozoa, Tunicates, etc. With robust investments in infrastructure,

The impacts of COVID-19 on the fisheries and aquaculture food systems vary, and the situation is rapidly evolving Fish and fish products that are highly dependent on international trade suffered quite early in the development of the pandemic from the restrictions and closures of global markets, whereas fresh fish and shellfish supply chains were severely impacted by the closure of the food service. The processing sector also faced closures due to reduced/lost consumer demand.

According to figures from India's Ministry of Commerce and Industry, Indiaexported4.13lakh metric tons of frozen shrimp in the first nine months of 2020, down 13 % compared with the same period last year.

The fall sees Ecuador surpass India as the world's largest exporter with the Latin American country growing its exports over the same period by 6% to 4.99 lakh metric ton.

However, India remains the biggest exporter by value, with exports over the January-October period worth $ 3.50 billion, down 11 % compared with the same nine months of last year.

According to Mr K. S. Srinivas, Chairman of MPEDA, Covid-19 caused a 7.4 per cent drop in quantity and 0.74 per cent in US dollar value during 2019-20. India shipped 1.29 million tones valued at ($6.68 billion) against 1.39 million tonnes worth $6.72 billion) in 2018-19. Mr Srinivas attributed the decline to sluggish demand in major export markets due to the pandemic that led to cancellation of several orders, reduced and delayed payments, slowdown of cargo movements and difficulty in getting new orders. The decline in sea catch along the west coast on account of reduced fishing days has also been a reason for the shortfall in quantity.

According to the Coastal Aquaculture Authority (CAA), there are 311 shrimp hatcheries in India registered to import specific pathogen free (SPF) L. *vannamei* brood-stock from 11 overseas suppliers, with an annual production capacity of 45 billion post larvae (PLs). There are also 90 Nauplii Rearing Centers with a capacity of 8.12 billion PLs that are registered with the CAA to produce seed for aquaculture farmers.

Current demand in the western markets of North America and Europe is mostly seen in the retail trade. Hence compared with other years, there will be increased demand for retail/consumer packs for frozen products irrespective of product forms (raw shell-on, peeled,

other semi-processed and processed shrimp). Dining out is unlikely to be the norm in the near future which will seriously reduce import demand for large sizes of shrimp (U15 to 21/25) in 2020.

It is therefore understood that against such prospects and problems and in post pandemic period a viable and affordable technology can immensely facilitate scaling up of fisheries production without compromising with limited water sources, ecological balances, and other major challenges.

Besides the traditional small and medium farmers and exodus of urban youth to the rural areas for taking up fish farming in post COVID-19 time can adequately be addressed with advanced technology (Biofloc, RAS etc.)

Redox AS, Norway is a global leader in bringing the innovation and technology with complete biosecurity in the fisheries sector. In view of tremendous response and acceptance of Indian aquaculture and fisheries fraternity of the state-of-the-art Norwegian technology, an Indian entity REDOXZON AQUA INDIA PRIVATE LIMITED, a wholly owned subsidiary of Redox AS, Norway has been incorporated in the year 2020.

Redox AS brought the state of the art technology "Micro Bubble Oxygen Generator, Small Oxygen Generator along with micro bubble diffusor hose, which are being used to save livestock in pond and fish tank. Container based RAS which will be used as plug & play system where 5 times production can be done with limited water". These technologies can help to the farmer to achieve the target of the farmers and the Government fisheries society.

Redox has long term sustainable objective for the growth of aquaculture in India with the vision of Atmanirbhar Bharat "self-reliant India", the need for transfer of advance technology in aquaculture for optimum and appropriate assimilation with existing farming practice is beyond doubt.

The state of the art technology developed by Redox in association with premier university across the glove has now found its application in the aquaculture and fisheries sector in India. The affordable technology of Redox coined "DOST" comprising extremely innovative aquaculture oxygen generator and micro bubble diffusion to enhance that DO multiple times has not only facilitated the scaling up the production but arrested the chance of proliferation of pathogen and there by mitigating the possibility of crop loss.

The Microbubble and Nano bubble technology is going to be the future of DOST.

The salient and significant technological advancement which we have brought is to replace the existing practice of giving air by 93% pure Oxygen in the dissolved water so that the aquatic animals like fish or shrimp get much higher level of Oxygen than the present system of giving air. This will lead to a higher density of culture, faster growth and better health. Therefore, the yield will be much higher than present practices. As a results the farmers can also take more crops in a year as the cycle time becomes lesser with the faster growth of the animal.

Secondly, the higher level of DO will also reduce the risk of proliferation of pathogens.

Thirdly, this Oxygen Generator consumes very little power to the tune of 500 watt compared to roots blower or paddle wheel aerator and any other mode of existing practices.

Fourthly, another advancement of technology which we have brought is to replace the normal bubble by injecting micro bubbles. These micro bubbles stay much longer time in water than normal bubble which steadily comes up and explode. Therefore, the Oxygen will dissolve in a much better fashion than normal bubble.

One must ponder that while Indian aquaculture fraternity was deliberating RAS technology for a long time why not a perceptible development has been observed so far.

Redox has brought a path breaking technology of Container Based RAS. That RAS technology is extremely significant for enhancing the production multiple times within the existing capacity built-up. However, the question remains while Indian Fisheries is deliberating on conventional RAS for long time no perceptible progress has made over the years on RAS implementation. In this regard we presume the following reasons.

A. It takes years to make a proper conventional RAS technology workable.

B. As RAS involves precision in controlling all water parameters, the human interference in conventional RAS is a serious factor and prone to create major catastrophe.

C. Conventional RAS is also very expensive enterprise.

D. The mobility of conventional RAS technology is seriously impaired as civil constructions and mechanical fixtures are to be commissioned on ground.

Against these shortcomings Norwegian patented container-based RAS have all such advantages as below:

i. Just plug-n-play by which it is instantly ready for operation as soon as one arranges water and electricity,

ii. Complete automations with sensors for maintaining precise water quality.

iii. Extremely economically viable with a decent ROI.

iv. Tremendous mobility and opportunity to procure partial or complete system as it is compartmentalized in different containers.

v. Great feasibility of temperature control thereby arresting the scope of proliferation of pathogen.

vi. This has proved that RAS can do 5 times production of Trout comparing with conventional fish (trout) farming. In India we are targeting the RAS for Shrimp, Trout, Seabass, Cobia, Pompano etc. the high valued fish in private and government sponsored farm and hatcheries.

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.

LIVE ROCKS FOR THE MARINE AQUARIA

jane2012maria@gmail.com

Jane Jacob and Thirunavukkarasar R
ICAR - Central Institute of Fisheries Education, Mumbai.

Highlight Points

- Marine aquarium industry thrives on wild caught animals.
- Reef aquaria rising in demand for their beauty and water filtration ability.
- Corals are harvested illegally to cater the demand for reef aquaria, aquaculture of live rock can help in sustainably fulfilling the rising needs of the industry.

Introduction

Fish keeping has been famous since time immemorial, in the ancient times it began with the stew ponds were fishes were kept alive for cooking, which then grew to be a thing of luxury for the royalty and bureaucrats. As centuries passed, it developed into a hobby, the hobby of aquarium keeping. It is diverse from freshwater to marine water aquariums, small fish bowls to large aquascaped glass tanks, the trade has developed into an industry on its known. It caters to and forms the livelihood of numerous people worldwide. The freshwater aquarium industry is flourishing with goldfishes, fighters, tetras, barbs, and the live bearers guppy, molly, platy etc. The marine industry is relatively in its infancy and has sprung into popularity after the 'Nemo effect' which refers to the Disney movie "Finding Nemo". Though the film was to shed light on the ill effects of transporting these fishes from wild to the four walls of the tank, it has grown into a phenomenon introducing more people to the concept of the marine aquarium. It is a fact that nearly 98% of marine ornamental fishes and other resources such as the corals are wild caught. The most popular type of marine aquarium is of a reef based aquarium setup. The issue of unregulated exploitation of marine ornamental fishes can be reduced through standardisation of breeding protocol. But corals are harvested through habitat destruction like blasting the reef, this can be prevented only through awareness and innovations in coral harvesting. This article is on live rocks, their aquaculture possibilities and potential to prevent or reduce the illegal harvest of corals from the oceans.

Types of live rock

Live rock can be classified into natural and artificial live rock. The natural live rock may further be divided into dry live rock and wet or just 'live rock'. The dry live rock is a dead coral removed from a coral ecosystem and cleaned to be sold as a live rock whereas the live rock is a dead coral which was released into leased portions of the sea/ocean and allowed to mature and it has certain amount of flora and fauna attached to it. Artificial live rocks are any substrate or hard rock matured in seawater to facilitate the development of required organisms in it, the most popular or in-demand one would be the one with a pink or purple hue indicating the coralline algae inhabiting it; this may also be live or dry. The disadvantage of any 'live' live rock would be that it is heavier and harbours higher amount of organisms which may be a potential threat to the aquarium in which it is placed or to the coral rock itself.

Corals (Natural live rock)

Corals are made of calcium-based compounds built from aragonite deposited by the reef-building corals,i.e. hermatypic corals. Corals are found in waters that are shallow and clear. They result in a very diverse and rich flora and fauna. Ideal conditions for corals is a temperature of 23-25°c and least turbidity. They inhabit the world oceans between the 30 deg N and 30 deg Si.e. in the tropical regions. CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) and laws of several nations prohibit the mining and destruction of these corals when alive. However, they are exploited and used in the illegal aquarium trades, limestone mining etc. The coral reef formed by the reef building coralcreatesan ecosystem in itself flourished by fishes, invertebrates, worms, etc. All attracted by the corals and its inhabitants. Thus, on the removal of a flourishing reef, the entire ecosystem is collapsed, which is why there are legal enforcements on mining of live corals.

Nevertheless, corals are living, and so they die owing to natural or anthropogenic causes. These dead corals can be harvested and inoculated with suitable coralline algae and left to mature in allocated areas in the ocean or sea waters. Research has also shown that maturation of dead corals has led to healthier coral ecosystems in the vicinity of the maturation sites. Maturation period for production of an excellent live rock will require a minimum period of 2 years.

Artificial live rock

Artificial live rock is any artificial substrate (Calcium carbonate rock, limestone rock) that acts as the base for the organisms to colonise. It maybe naturally available rocks or artificially prepared using a recipe. Naturally available rocks which are most compatible for production of live rock is the volcanic or igneous rocks and even the desert rock. These rocks are selected, keeping in mind porosity as a critical factor. In the absence of such natural rocks, artificial ones are created using portland cement, ceramic etc. Cement is said to have a pH that might disrupt the pH balance of the aquarium; hence it is advised to use substances with least pH altering capacity. The selected base substances with a mixture of binders are mixed in various proportions and shaped into desired shapes and cured as the live rock for maturation. Curing is a vital step in the making of artificial live rock because otherwise there may be some harmful chemicals that maybe released from the rock after it is placed in the maturation waters especially since it is saline water and it can trigger chemical reactions.

Requirements for live rock aquaculture

The water must be clear as coral usually inhabit clear waters, i.e. oligotrophic waters. The corals and zooxanthellae require light hence the need for clear waters. They also require good water circulation because most of the coral and related organisms are sessile and require nutrients brought to them. The speed of water recirculation maybe between 12.4 to 20.5 cm/sec. The first step is to identify suitable substrates; they maybe dead corals (If legally permitted) or limestone rocks. The size of the rocks must be convenient to fit into an average aquarium, also making it easier for transportation. The rocks are placed in the selected site and left undisturbed for a minimum period of one year. They are regularly checked for inhabitation of life forms on it. If the species composition is few, seeding can be done with locally available or permitted animals and plants. If the coralline diversity is less, the water maybe fertilised with some potassium, nitrogen and phosphorous for increasing productivity of the waters without affecting its turbidity.

Live rock as a natural water purifier in aquaria

Live rock (Picture courtesy: https://arcreef.com/live-rock/live-rock-guide/**)**

Biological filters are a boon to the aquarium industry. Live rocks are highly efficient in it. They are a community of cleaning organisms. The process begins with the small crustaceans and worms taking up the left over feed and fish waste. The animals process the waste into their waste products majorly ammonia. The microbes inhabiting the rock facilitate nitrification and converts ammonia into nitrate. Nitrate is an inorganic nutrient, and it will be absorbed by the symbiotic algae growing on the live rock and converted into biomass. Live rocks are the best because they can harbour anaerobic bacteria also that can transform the waste compounds, these anaerobes live deep inside the crevices of the live rock which will not be possible in a conventional biofilter.

How to set up a live rock aquarium

A reef aquarium (Picture courtesy:e-Bay)

A large glass tank is best for setting up a live rock aquarium because the live rocks are big. Additional filtration is best to ensure the health of the inhabitants of the tank, and protein skimmers are also installed to remove the excess nutrients released. As corals contain photosynthetic organisms, light is integral to their survival, light bulbs of 1-2 watt per gallon (3.78 l) of water is an essential requirement. Once the tank is setup, it is time to place the centrepiece, i.e. the live rock. It is best to cure it in the same water beforehand. A fully grown live rock must not be introduced into a new tank setup. A pre-cured, seeded live rock with least growth of organisms on it is the best. Once it is placed, let it adjust to the new environment and look out for signs of death and decay. If it is seen, the addition of nutrients like calcium, strontium maybe tried. Live rock aquaria maybe FOWLR (fish only with live rock) or whole reef setup. Once the rock is stabilised, the fishes and other inhabitants such as starfishes, urchins, crabs, etc. can be released based on the type of aquarium you wish to setup.

Corals in India

India has only a handful of coral reef along the Lakshadweep, Palk bay, Gulf of Kutch and the Andaman, Nicobar Islands as well as in certain areas along the west coast. The east coast has a high input of freshwater and silt from the rivers which make them unsuitable for the growth of corals on a larger scenario. Other disincentives to reef growth are the heavy monsoonal rains and the high human presence on the coastline. Unfortunately, the coral biodiversity in India has been degraded since the 1960s for construction, limestone mining etc. The rules amended by the government of India under the Coastal Regulation Zone act 1991 protects

MM Gears Pvt Ltd.
Delivering Innovation

A' Series - Aqua Culture Gearbox

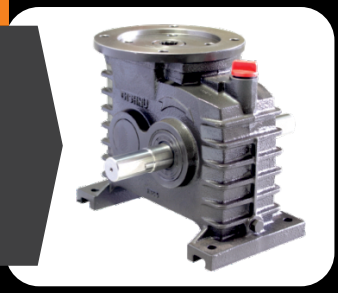
GISHNU
Transforming Innovation

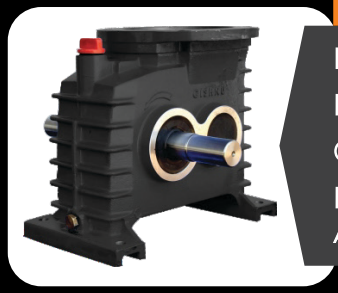
Gishnu Gears, an ISO 9001-2015 certified company is a leading manufacturer of gearboxes in India, backed by expertise spanning to three decades - The company offers superior products of international standards

FLOATING BEVEL GEAR BOX

Type : A3 Power (Casting)

Range : 1 hp to 3 hp
Pedals : 4, 6 & 8
O/p RPM : 105, 120, 140 & 160
Power savings : 75%





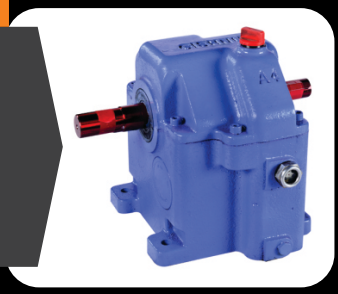
Type : A3 Aero RF (Aluminium)

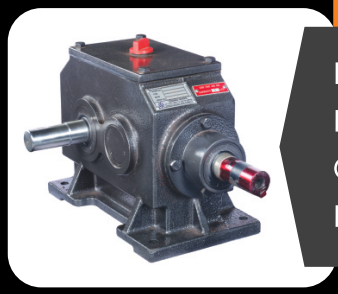
Range : 1 hp to 3 hp
Pedals : 4, 6 & 8
O/p RPM : 105 & 120
Power savings : 75%
Aluminium housing with Anti-rust coating

LONG ARM GEAR BOX

Type : A4 Single Side

Power savings : 70%
O/p RPM : 72 & 115
2 hp = 12 Pedals
3 hp = 16 Pedals





Type : GBH

Range : 3 hp & 5 hp
Pedals : 8+8 & 20+20
O/p RPM : 105 & 120
Power savings : 60%

Delivering More than Expectation

A' SERIES SPARES


Spiral Bevel Pair


Helical Pinion


Helical Gear


Worm Wheel Pair

SF No: 796/1B, Near Hotel Le Meridien,
Neelambur, Coimbatore - 641 062,
Tamil Nadu.

Mob : 99439 17774 | 96558 63638

E : marketing@gishnugears.in / marketing@mmgears.in
www.gishnugears.com I www.mmgearsindia.com

coral reef and also any corals located in a protected area becomes protected by default, Even though it had led to awareness and need to restore and protect corals and mangrove ecosystems, the destruction spree continued for construction, calcium carbonate sourcing, curio for tourists etc., the corals were also harvested illegally by smugglers for the aquarium industry. But, there is hope, with the aid of few enthusiasts and environmentalist organisations like the reefwatch India, there has been the installation of biorock off the coast of Kutch to restore the coral ecosystem of the region. Biorocks are artificial structures connected to a source of electricity to promote deposition of calcium carbonate on the structures thereby rebuilding the corals. When the reef and surrounding area is placed under the watch of the judiciary, the livelihood of the local people is at stake which forces them to resort to illegal and unsustainable measures. There are several projects taken up by universities, research foundations in collaboration with the government but more practical solutions would be those involving the inherent population of the locale.

Potential of artificial live rock production/ live rock aquaculture in India

Aesthetics have become an integral component of the modern way of life and marine or salt water aquarium are beautiful addition to raising the standard and looks of any room. A marine aquarium would be incomplete without a coral or reef in it, hence live rocks will be of demand in the near future if not already. Furthermore, any form of aquaculture will create employment and entrepreneurship. Till date, the Indian marine aquarium industry business has live rocks available for sale that are imported from Phillipines, Fiji and other pacific islands which are hydrated and rejuvenated before sale in the market. There are several websites in the Indian industry for sale of live rocks. They present varieties of live rocks for sale. Some of them being Fiji rocks, Pacific live rocks, real reef rocks etc. They charge at an average of Rs.500/ Kg of live rock. Live rock aquaculture can be taken up only in the coast or near the sea. Hence it can provide alternate livelihood to fishers during lean season and ban periods. It will also make them responsible for the ecosystem around them as the corals require clear and unpolluted water for efficient growth and maintenance. Like the seaweed culture in the Gulf of Mannar, live rock aquaculture can be an exciting proposition for the women self-help groups in the region. It can reduce the dependence of Indian aquarium business persons on imported live rocks also avoiding chances of transferring any pathogens from one part of the world to another. It can utilise under utilised water resources along the coast or any areas with accessible saline water. In Florida, USA an abandoned limestone quarry was successfully converted for live rock production, India can also survey potential sites and reuse them. The whole area can also be developed for eco-tourism.

Conclusion

Aesthetics and home decoration have become a very integral part of the lifestyle in modern times. Also, the soothing effect of fishes and aquarium to calm the mind and body is an advantage. Marine aquariums are exceptional in terms of beauty and variety. They can be set up in any number of arrangements and corals are integral in all of it, especially a reef aquarium. Thus, the demand for corals can never diminish and let's make sure that our aquariums have corals from legal sources and promote live rock culture for fish keepers, sellers as well as the progress of our nation.

Bibliography

Hoon, V., 1997, December. Coral reefs of India: review of their extent, condition, research and management status. In Proceedings of the Regional Workshop on the conservation and sustainable management of coral reefs. MS. Swaminathan Research and BOBP, Chennai (pp. 1-25).

https://arcreef.com/live-rock/live-rock-guide/

https://setupaquarium.wordpress.com/2008/03/28/working-with-live-rock/

https://www.marineworldindia.com/

Mohit, R., 2020. India's First Solar Powered Biorock to Conserve Endangered Corals in Gulf of Kutch, Gujarat. *Sustainable Humanosphere*, *16*(1), pp.1309-1317.

Periyasamy, C., Anantharaman, P. and Balasubramanian, T., 2014. Social upliftment of coastal fisher women through seaweed (Kappaphycusalvarezii (Doty) Doty) farming in Tamil Nadu, India. *Journal of applied phycology*, *26*(2), pp.775-781.

Rajagopal, S. and Sethnarayanan, D., 2006, December. Conservation of marine ornamental fishery resources along Gulf of Mannar through aquaculture. In *National Research and Monitoring Moderation Workshop* (p. 64).

Simões, N., Altamira, A., Shei, M. and Perissonotti, F., 2017. Live rock. *Marine Ornamental Species Aquaculture*, pp.385-401.

Teitelbaum, A., Yeeting, B., Kinch, J. and Ponia, B., 2010. Aquarium trade in the Pacific. *SPC Live Reef Fish Information Bulletin*, *19*, pp.3-6.

Wurts, W.A., 2016. An Abandoned Marine Quarry: A Unique Resource for Aquaculture. *WORLD AQUACULTURE*, p.61.

BIO - PACKAGING: A SUSTAINABLE TOOL FOR FOOD QUALITY ENHANCEMENT

kasturi.phtpa801@cife.edu.in

Kasturi Chattopadhyay, Sanchita Naskar, Triparna Pahari, and K.A. Martin Xavier

ICAR- Central Institute of Fisheries Education (CIFE), Mumbai-400 061, India

Highlight Points

- Use of synthetic packaging materials harbours an ever increasing risk of environmental hazards.
- Biological components as packaging components (several antimicrobial and antioxidant agents) as films and coatings can safeguard the environmental concerns.
- Bio-packaging can be a safer alternative for improving the overall nutritional value in frozen seafood products.
- Sources include- various carbohydrate, protein and lipid sources as well as composite blends.

Introduction:

Modern day people all over the globe consume a variety of food ranging from raw to ready-to-eat (RTE) food items, including seafood products. Seafoods includes various species of mollusks, marine mammals, finfish, crustaceans, fish eggs that are having high consumer demands in international trade. These food forms a rich source of nutrition in terms of high quality proteins, omega-3 fatty acids, essential micronutrients, and certain vitamins and minerals. However, high risk of contamination with food borne pathogens having ability to form biofilms in seafood results in fatal disease outbreaks in humans worldwide. The common bacterial pathogens associated with biofilm formation in seafood are *Vibrio spp., Aeromonas hydrophila, Salmonella spp., and Listeria monocytogenes.*

Use of synthetic packaging materials such as polyethylene films, is associated with ever increasing risk of environmental hazards. This demands for an urgent need of using new innovative eco-friendly bio-packaging films and coatings that can safeguard the environmental concerns and yield higher profitability to the sea food industries. Recent advances in food technology incorporate several antimicrobial and antioxidant agents into edible films for manufacturing low-cost biodegradable packaging from sustainable sources. Application of edible coatings as a layer of protection outside the food can prevent the problem of moisture loss, drip loss, loss of volatile flavor; can enhance the product representation in retail packages; reduce the rate of rancidity and spoilage caused by pathogenic microorganisms and can improve the overall nutritional value in frozen seafood products.

Sources of biodegradable films

- **Carbohydrate Source:** Starch, Chitosan, Cellulose, Alginate, Carrageenan, Pectin, Gellan gum
- **Protein Source:** Corn zein, Wheat gluten, Soy proteins, Casein, Collagen and Gelatin.
- **Lipid Source:** Waxes, Fatty acid esters (Triglycerides, Diglycerides, Monoglycerides), Vegetable oils, Stearic acid, Oleic acid.

Carbohydrate based coatings:

a. Starch based films

Starch is widely used in production of biodegradable films as a replacement of plastic polymers due to its cheap cost. The most commonly used polysaccharide components are: Wheat flour, corn flour, starch or modified starch and gums that can improve viscosity, emulsifying and foaming capacity, texture and shelf life in fish. When incorporated with chitosan and lauric acid, the starch based films has synergistic antimicrobial effect.

b. Chitin and chitosan

Being a nontoxic, biocompatible, and biodegradable polymer,

it is considered as an environmentally friendly packaging material. Further, its ease for film formation, gas barrier and microbial growth inhibition properties of chitosan against a wide array of yeasts, fungi and bacteria, makes it an interesting choice for safe food packaging applications. Chitosan coating on food surfaces offers a great advantage in inhibition of development of life threatening seafood pathogen- *Listeria monocytogenes*. Recently, Chitosan nanoparticles have been successfully used as fillers to improve the thermo stability of films and enhance its mechanical and barrier properties.

c. Cellulose and cellulose derivatives

Cellulose is the structural polysaccharide of plants linked with citric acid film that contained adsorbed nisin can control Listeria monocytogenes in packaged seafood products.

Protein-based coatings

Proteins in their native states usually exhibit either fibrous structures forming structural material in animal tissues that are water insoluble or as globular soluble proteins that function widely in living systems. Protein films are derived from solutions or dispersions of the protein as the solvent evaporates after required denaturation by heat, acid, base and/ or solvent for forming more extended structures required for film formation.

a. Coatings based on fish myofibrillar proteins

Development of edible biopackaging films from fish myofibrillar protein serves dual function of using low cost fish as edible coating for improving the quality of high-value seafood. This enhances sensory, biochemical and microbiological attributes in fish products by reducing the rate of dehydration and lipid oxidation during chilled as well as frozen storage.

b. Collagen

Collagen-based edible films are used in many meat products as coatings thus enhancing the shelf life properties.

c. Gelatin

Gelatin derived by partial hydrolysis of collagen, can be made into films for its applications in the pharmaceutical and food industries including micro-encapsulation of ingredients and manufacture of tablet and capsule coatings.

d. Whey proteins

Edible coatings in the form of whey protein isolate (WPI) and acetylated monoglyceride (AMG) reduces rate of moisture loss and lipid oxidation during frozen storage of many fatty fishes.

Composite films or coatings

Development of composite edible films and coatings consists of a heterogeneous blend of polysaccharides, protein, and/ or lipids. They include: Methyl cellulose and lipid, Methyl cellulose and fatty acid, corn zein, whey isolate and lipids, casein and lipids, corn zein and corn starch, gelatin and fatty acid, soy protein isolate and gelatin. These effectively assist in utilization of distinct functional characteristics of individual class of film former.

Bioactive agents for packaging:

Bacteriocins: These are antibacterial peptides produced by lactic acid bacteria. These agents are generally heat-stable, apparently hypoallergenic and readily degraded by proteolytic enzymes in the human intestinal tract.

Spices: These are rich in phenolic compounds, such as flavonods and phenolic acids, which exhibit a wide range of biological effects, including antioxidant and antimicrobial properties. They are regarded as "natural" alternatives to chemical preservatives. In addition, their use in foods meets the current demands of consumers for mildly processed or natural products. However, their practical application is limited due to flavor considerations, as well as their effectiveness which is moderated due, in particular, to interaction with food ingredients.

Enzymes: Due to health concerns, producers are now particularly interested in the use of biopreservatives such as antimicrobial enzymes in packaging. Lysozyme, a 14.6 kDa single peptide protein produced by many animals including man, which would exhibit enzymatic activity against the peptidoglycan of the cell wall of both Gram-positive and Gram-negative bacteria, to limit bacterial growth in meat.

Preservatives and additives: Various organic acids are used because of their efficiency and cost effectiveness. Sorbic acid and its more soluble salts are widely used as preservatives in various food products. An alternative to the incorporation of antimicrobial compounds during extrusion is to apply the antimicrobial additives as a coating. This has the advantage of placing the specific antimicrobial additive in a controlled manner without subjecting it to high temperature or shearing forces. In addition, the coating can be applied at a later step, minimizing the exposure of the product to contamination. The coating can serve as a carrier for antimicrobial compounds in order to maintain high concentrations of preservatives on the surface of foods.

Conclusion

The use of non-biodegradable packaging materials in food producing industries to improve the product quality and storage life lead to an enormous environmental hazard and human health related problems. Therefore, to safe guard and to preserve the environment, the use of alternate food processing technologies is the need of hour. Several biodegradable coatings/films are produced from the different carbohydrate and protein sources and these coatings/films could be used safely for improving the seafood quality and storage life. The seafood processors are suggested and encouraged to use various biodegradable coatings/films in processing the seafood. More and more research and development efforts are required to produce new biodegradable food preservatives to sustain the ecological balance and protect the environment from further degradation.

References:

Håstein, T., Hjeltnes, B., Lillehaug, A., Skåre, J.U., Berntssen, M., Lundebye, A.K., 2006.

Food safety hazards that occur during the production stage: challenges for fish

farming and the fishing industry. Rev. Sci. Tech. (Int. Off. Epizoot.) 25, 607-625

Note: More References can be provided on request.

Team Agrotech

YOUR STEPPING STONES IN SUCCESS!!

Country Representative
CPM ASIA

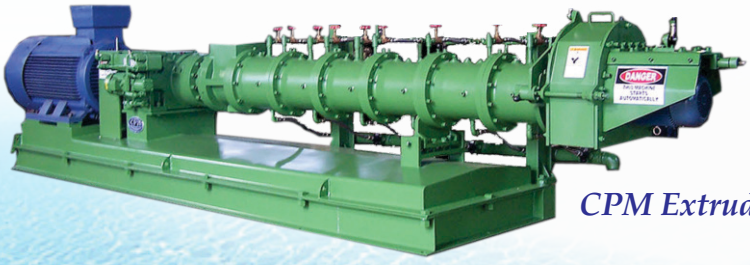
Your Single Stop Source for

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

Polychaetes Worms – Superior Live Food For Fish and Crustaceans

M. Satheesh[1], P. Yuvarajan[1],T. Sanjay[1] and M. Subashini[1]
[1]Dr M.G.R. Fisheries College and Research Institute, Ponneri,
Tamil Nadu Dr J Jayalalitha Fisheries University, Nagapattinam.

Highlight Points

- Polychaetes are highly nutritious live food for fishes and crustaceans.
- Polychaete worms rich in EAA , EFA, carotenoids andphospholipids which are play a majour role in maturation and colouration of fishes.
- In the ecosystem they posseses a specific part in biogeochemical cycles and reduces organic pollution in waterbodies.
- They served as a bait for sport fisheries and sea angling.
- Compared to other live food, they have a good market value and demand.

Aquaculture is a rapidly developing industry in the India to fulfil the food demand and boost the Indian economy. Feed industry contributes vital role in aquaculture. In that, fish meal is a major ingredient used to develop the fish and shrimp feed. Protein content of the feed has been decided a quality and price of the feed. Generally the fish unable to synthesizes fatty acids directly like linolinic, linoliec and arachidonic acid and whilst time, decrease the production of fish meal we can move to the unconventional feed ingredients to replace fish meal. A disease free healthy stock can be achieved by feeding appropriate live feeds.

Importance of Live Feed in the Aquaculture industry:

Artificial feeds are not match to live feed organisms in terms of acceptance and nutritional factors. Live feeds have rich protein and essential fatty acid content (unsaturated fatty acids, HUFA) for better growth, efficient breeding, survival (Mandal et al., 2012), sexual maturation (Browdy, 1992) and reproductive performance (Meunpol *et al.*, 2005) of cultivable organisms. Apart, live feed has organic acids, carbohydrates, vitamins, and minerals and hence they are commonly known as **"living capsules of nutrition"**. Polychaete worms have superior qualities than other live foods , so we can use polychaete worms as a live food for aquatic organisms.

Polychaete worms- An introduction:

The Polychaeta or polychaetes are a class of annelid worms, generally marine. Each body segment has a pair of fleshy protrusions called parapodia that bear many bristles, called chaetae, which are made up of chitin. Indeed, polychaetes aresometimes referred to as **bristle worms**. More than 10,000 species are described in this class.

Systematic classification:

Kingdom : Animalia
Phylum : Annelida
Class : Polychaeta
Subclass : Sedentaria
Infraclass : Scolecida

Habitat:

Common representative includes the lugworm (*Arenicola marina*) and sandworm or clam worm . Polychaetes as a class are robust and widespread, with species that live in the coldest ocean temperatures of the abyssal plain, to forms which tolerate the extreme high temperatures near hydrothermal vents. Polychaete worms live in every type of habitat in the seat hey can be found in the sands of any beach, all the way down to the deepest depths of the oceans. There are, however, a few species that do live in freshwater and also abundant in sea grass beds and mangrove areas, where large concentrations of organic matter accumulate from shed leaves. On intertidal reef flats, these soft-bodied worms are an important food source for wading birds at low tide, and for fish and crustaceans at high tide.

Most of the polychaetes are crawl the bottom, but some of the polychaetes have various modifications to their body structure based on that it can be adapted to many different ecological niches, includes burrowing, swimming, pelagic life,

tube dwelling or boring, commensalism, and parasitism.

The distribution of polychaetes is largely dependent on the type of substrate present.

Example:

- The size and type of sediment for burrowers.
- The presence of suitable reef substrate for the borers and nestlers.
- Hard substrates for encrusting species to settle on suitable algal substrate for species that live in seaweed.
- Additional factors such as exposure and water currents are important for filter-feeding organisms.
- Species living in sediments need to have stable sediments, so high energy beach environments are typically low in the number of species and individuals.

Protection and predation

All polychaetes are soft-bodied, thus need protection from predators. This can be achieved either by secreting a tube into which they can rapidly retract or by living in habitats, where they can burrow and avoid predators. A few species have developed additional anti-predator strategies. For example, the numerous spiny chaetae (bristles) of amphinomids may make them unpalatable to fish and other predators. However, fish and bird gut contents reveal that polychaetes are an important prey item for many species and, even when buried in sediments, polychaetes can be preyed upon, providing an easily digestible and abundant food source.

How do polychaetes reproduce?

Polychaetes exhibit both sexual and asexual reproduction. While, most polychaetes are dioecious (males and females separate), some species are hermaphrodites (possess both male and female organs).

Polychaetes may live for a few weeks or months to many years. Some breed continuously over several months, while others are restricted to spawning on a single day.

Food and Feeding Habits of polychaetes:

Polychaetes worms could decay most of the organic matter present in the sediment or mud. Majority of them are filter feeders. Trochophore larvae of polychaetes feed the phytoplanktons .Higher amount of organic matter indicate the abundance of polychaete worms.

Importance of Polychaetes in Aqua Feed industry:

Polychaetes are recently used as an ingredient in formulating feeds for fish, crustaceans and other organisms. They had commercial importance as baits for sea fishing (sport angling) and used as an aquaculture feed either live, in blast frozen form, or as a constituent of formulated feeds. They are used as a maturation diet for shrimp brood stock (Olive, 1999). In commercial shrimp hatcheries, brood stock fed with live polychaetes, whichpromotes higher fecundity resulting in higher production of eggs and larvae, due to the high content of polyunsaturated fatty acids, especially arachidonic acid, eicosapentaenoic acid and docosahexaenoic acid in the polychaetes (Luis and Passos, 1995). Polychaeta could be used for the improvement of diets in hatcheries and larval rearing units for both finfish and Crustacean.

Whilst time polychaete worms are rich in carotenoids so incorporation of polychaetes in the diet of ornamental fishes may increase the colour pattern.

Source of essential fatty acids and essential amino acids:

The use of polychaete worms could ensures adequate nutrition for brood stock of crustaceans& fishes. Because, it has rich source of Essential Fatty Acids(EFA)and Essential Amino Acids(EAA) which are listed in table 1.

Essential Fatty Acids(EFA)	Essential Amino Acids(EAA)
Alphalinolenic acid	Cystine
Linolenic acid	Proline
Oleic acid	Leucine
Stearic acid	Lysine
Palmitic acid	Aspartic acid
Moroctic acid	Threonine
	Glutamic acid
	Asparagine
	Phenyl alanine
	Histidine
	Valine
	Isoleucine
	Glycine
	Serine
	Tyrptophan
	Alannine
	Arginine
	Tyrosine

Table 1. Polychaete worms contains rich source of essential fatty acid and essential amino acids.

Uses in sport fisheries:

Polychaete worms are used as bait in sea angling sport and leisure fisheries. Mostly the rag worms(Neris spp) and lug worms(Arenicola spp) are the two main polychaete groups, which are used for baits and Neris virens(sars) is the most important species(Olive, 1994).

Importance in aquatic environment:

- Polychaetes are both ecologically and economically important, as they are useful component in the food web of marine ecosystem.
- They are vital food for many important fishes.
- It act as bioindicators, which indicates marine pollution.
- Polychaetes play a vital role in the food chain which generates food resources from the ocean.
- They play a major role in biogeochemical cycles.
- By consuming micro-particulate organic matter, polychaetes convert low value dispersed organic matter into an aggregated and concentrated food source for large fish and crustaceans.

Role of polychaetes in coral reef and wetland ecosystems:

Over accumulation of organic matter leads to problematic to the coral reef ecosystem. It will essential for the photosynthesis to meet over that, polychaetes could significantly contribute major to convert the organic matter into the food. So collection of polychaetes in that area will destroy the ecosystem. At the same time polychaetes occurance is more in wetlands and mangroove areas, because of high organic load.

Polychaetes in toxicity testing:

- Polychaetes such as Neris virens are widely used in sediment toxicity bioassays.
- Members of the Neridiidae family have been favoured for cytogenetic toxicity bioassays (Olive and wang, 1997).
- To detect the contaminents such as Polychlorinated Biphenyls(PCB) from bioaccumulation.

Care must be taken while using polychaetes:

- The polychaetes should be virus free when used as shrimp feed.
- It should be properly washed & disinfected prior to feeding.

Threats to the polychaetes:

Because of the best nutrient profile, the polychaetes are frequently harvested from the areas. Improper harvesting of polychaetes will leads to collapse the sustainability and reproduction of the population of polychaetes. Aquatic Pollution was a main threat to polychaetes.

Conclusion:

Polychaete worms are a kind of marine pests. They have a wide applications in aquaculture, aquafeed industry, live bait industry, toxicity testing, role in food chain, prevent coral bleeching and better nutrient profile. So the proper harvesting and utilization will leads to the sustainability of the polychaete worms. Development of easy and economically viable culture techniques recommended into fulfil the polychaetes demand.

Save polychaetes !!!

Save ecosystem!!!

Reference:

- Browdy CL. A review of the reproductive biology of Penaeus species: perspectives on controlled shrimp maturation systems for high quality nauplii production. Proceedings of the special session on shrimp farming, (SSSF'92), World Aquaculture Society, Baton Rouge, LA, USA, 1992, 22-51.
- Luis, O. J. & A. M. Passos, 1995. Seasonal changes in lipid-contentand composition of the polychaete Nereis (Hediste) diversicolor.Comp. Biochem. Physiol. B. 111: 579–586.
- Mandal S,Harkantra SN. (2012) Changes in the soft-bottom macrobenthic diversity and community structure from the ports of Mumbai, India. Environmental Monitoring and Assessment doi: 10.1007/s10661-012-2582-4

Note: More References can be provided on request:

satheesh1231999@gmail.com

Gender based Fisheries and Aquaculture Practices

Abhishek Kumar, Binod Kumar Choudhary, Mamta Choudhray

Highlight Points

- Women Empowerment in Fisheries Sector.
- Women in Agriculture are closing the gender gap for Development.
- Women in organized processing sector.
- Promotion of equal access to resources and opportunities.
- Elimination of Gender Discrimination.
- Socio Economic Upliftment of Women.

Background:

Historians believe that it was women who first domesticated crop plants and thereby initiated the art and science of farming. Indian rural women have always been an important and prominent partner in sustainability of agriculture sector. Since ages, women continued to be the important stakeholder in farming activities in India. Involvement of Indian women in farming enterprise has been on rise in recent years. Other than crops they are involved in allied sectors like Fisheries, animal husbandry, dairying, piggery, poultry, sericulture and apiculture. The extent of women contribution is aptly highlighted in a study conducted in Andhra Pradesh where it has been revealed that work day of women agricultural labour during season lasts for 15

hours and her male counterpart works for 7 to 8 hours (Mies, 1986, (Swaminathan, 1985). Fishery is the oldest and most important livelihood option for the inhabitants of the country since times immemorial. Approximate of about 1 % of the total population depends upon fishery sector in India as a primary source of livelihood – direct employment to about 6 million fishermen and to another six million people who are employed in fishery related activities. India is endowed with 2.02 million sq. km of EEZ (Exclusive economic Zone) along with a coastline of 8129 km and 0.5 million sq. km continental shelf with a catchable annual fishery potential of 3.93 million tonnes occupying a very important strategic position in the Indian Ocean. The aquaculture resources in the country comprise 2.25 million ha.of ponds and tanks, 1.3 million ha. of bheels and derelict waters, 2.09 million ha.of lakes and reservoirs and also 0.12 million kilometres of irrigation canals. Among the Asian countries India ranks second in the culture and third in capture fish production and one of the top leading exporters of sea foods (FAO, 2009, Ayyappan and Diwan, 2007). Fisheries and aquaculture are the sources of livelihood for over 14 million Indian people and also contribute to foreign exchange earnings considerably, constituting about 1% of the total gross domestic product (GDP) and 5.3% of the GDP from the agriculture sector of the country (DAHDF, 2011). Aquaculture is always consumer driven and the extension services need to focus their efforts beyond technology dissemination to adoption of food safety practices, value addition, environment safety and social responsibility issues, such as Fisher women empowerment. Aquaculture extension services are expected to facilitate the Fisher women farming community to access backward and forward inputs and services, educate the farmers on better farm management practices, food safety guidelines and enforce regulatory guidelines for the planned aquaculture growth. However, insufficient extension service orientation, inadequate manpower and lack of budgetary provisions for extension work have hampered the public extension agency in providing the expected service.

Introduction:

A key message from the Food and Agriculture Organization of the United Nations' report *The State of Food and Agriculture 2010–11. Women in Agriculture – Closing the Gender Gap for Development* (FAO, 2011) was that women's relative lack of access to education and extension services contributed to the "gender gap" in agriculture (including aquaculture) productivity. Gender concerns in the fishery business have a different dimension altogether in terms of physical as well as financial exploitation of the women even though they play an important role in the fish supply chain at the local level. The centre of power in terms of decision making, trade, financial access over product and market had been traditionally the domain of the male counter parts and women have little say in it. Fish drying and selling is the major activity in which the women are involved. The financial exploitation of women is severest in the market place because of the unregulated market. Also the choice in terms of purchases is very limited at the landing centre where they have say only for the products of low value and category. Men and women engage in distinct and often complementary activities that are strongly influenced by the social, cultural and economic contexts in which they live. Male–female relations in the fisheries sector vary greatly and are based on economic status, power relations and access to resources. More commonly, in coastal artisanal fishing communities, women manage the smaller boats and canoes that go out fishing. Women are also involved in gathering shells, sea cucumbers and aquatic plants in the intertidal zone. They also contribute as entrepreneurs and provide labour before, during and after the catch in both artisanal and commercial fisheries. In addition, they are often responsible for skilled and time-consuming onshore tasks, such as net making and mending, processing and marketing catches, and providing auxiliary services to the boats. However, gender issues in the fisheries and aquaculture sector have seldom been examined, and the important role women that play has often been overlooked and, thus, not taken into account in decision-making processes and outcomes, thereby hindering development. When fish business activities are being up-scaled in response to increasing globalization, local women risk being forced out of the business and, therefore, not benefiting from development and market opportunities in the sector in which they were previously extensively involved.

Picture showing Fisher women selling the farm produce in fish market in Purnea District of Bihar

Picture showing Fisher women selling their farm produce in fish market in Katihar district of Bihar.

Gender based fisheries activities:

In India fish is often a secondary source of food. Under such circumstances, fishing communities are a marginalized group occupying a lower priority in state policies relating to food. The priority given to fisheries in state policy is further attenuated when it comes to women. The fisheries sector has seen significant change over the last couple of decades in the region. Women in coastal states play a significant role in the small-scale fisheries sector. About 30% of women in rural and coastal areas are directly or indirectly engaged in small-scale fisheries. The major areas of women's involvement are aquaculture, shrimp culture, fish processing, net, gear and craft making. Though women in India are not involved in active fishing from the sea, they participate in certain forms

of fishery as a family along with the men. This is usually seen in the estuarine areas where set bag nets are employed for fishing. However, a study of the set bag net fishing communities also revealed that though women work as a family in the set bag net fishery, their work remains largely unrecorded. In any case, set bag net fishery as an occupation is very low paying and most fishers involved supplement it with other occupations. Capture fishery in rivers, lakes and reservoirs, paddy fields and marginal lands and swamps are widely scattered throughout the country and is not organized. Most of the fishers involved in capture fishery are widely dispersed along rivers and other water bodies. They use mostly their traditional boats and fishing gears and thus generate only marginal economic benefits. Traditionally, rural women are involved either in fishing or fishing-related activities. To enhance fish production, a number of inland water bodies, e.g. lakes, reservoirs and swamps have been stocked with selected species of indigenous as well as exotic carps in collaboration with local fisher communities. In these inland water bodies, women are actively involved in mending nets, laying out the fishing gears, harvesting and marketing of the catch. Women farmers participate in various fields of inland fisheries. In aquaculture, rural women are deeply involved in manuring fish ponds, feeding fish, harvesting and marketing farm products.

Women in the fish marketing sector:

While fish processing is a female-dominated activity in the South Asian region, marketing of the processed product as well as selling of fresh fish is often seen as undesirable activities, usually a last resort for a poor family. Retail fish marketing is often best achieved through individual small-scale enterprise. In India, owing to the lack of an established marketing infrastructure and the demand for cheap fish, women have created a niche for processing and marketing fish at very low costs in the supply chain of fishes. The supply chain is defined as "the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers and final disposal after use."The important supply channels which cater to the various usages are –marketed fresh (70% of fish catch), fish drying and curing industry (14% of fish catch), Frozen fish production (6.5% of fish catch), reduction to fish meal (8.4% of fish catch), offal reduction (0.8% of fish catch), miscellaneous purposes (1.6% of fish catch). The most important supply chain is for the fish marketed fresh owing both to the size of market as well as the nature of the product i.e. perishability. A study undertaken by the Department for International Development (DFID) Post-Harvest Fisheries Project along the east coast of India, documents the heterogeneity among women who are involved in fresh and processed fish marketing (Post-Harvest Fisheries Project, Department. The three categories identified are:

a. Head loaders:

These are women who deal in small quantities of low value species, which are sold in inland villages. b. Petty fish traders: These are women who deal with medium value species and have considerably higher investment capacities and are therefore considered credit worthy by non-institutional credit sources. c. Dry fish traders: These are older women who are primarily involved in fish salting and drying in a large scale. Fish for processing is procured during "glut" landings of a particular species and they usually employ family labor (including their own) for processing activities. These women access weekly markets and are usually wholesalers. However, with the increasing use of ice and consequent movement of fish in its fresh form, this group is affected. While women in the post-harvest fisheries sector in India are more visible in fresh fish trade, It is important to recognize that credit plays a crucial role in fish marketing activities. To enable the participation of women in this sector, credit should be made easily available at affordable interest rates to better address the needs of women in fish marketing.

The role of transportation:

Studies done by the DFID Post-Harvest Fisheries Project in the state of Tamilnadu along the East coast of India, document the problems faced by women in accessing public transport. One of the problems that has emerged with centralization of fishing has been the increasing distances to landing sites, as village landings have decreased. Women involved in fish marketing today have to travel long distances to buy fish and again tosell it. Considering that most fishing villages are often poorly linked by roads, access to public transport becomes a question of primary importance.

Women and the organized processing sector:

The organized processing sector such as the shrimp processing units, usually employ women as peeling labourers. In India, these are found along the coasts of Veraval, Mangalore, Goa, Mumbai, Calcutta and Bhubaneswar. Studies done in India showed that it is usually migrant young women who are preferred as labourers in these units, which are mostly export-oriented and exploitative. Fishing, including aquaculture, and their associated downstream activities, like fish processing, are among the most depressed economic activities. Women from poor fisher households are involved in fish processing, aquaculture, small-scale artisanal fishing and fish mongering, but less often in commercial fishing using bigger vessels.

Outlook for Women empowerment in Fisheries:

Gendered value-chain approaches can be used to recognize and value women's roles and contributions to agriculture and fisheries. To mainstream gender equality in development cooperation programmes and related activities, a number of steps are essential. Information provided by FAO indicates that, in 2008, 5.4 million women worked as fishers and fish farmers in the primary sector and represented 12 percent of the total. In two major producing countries, China and India, women represented 21 percent and 24 percent, respectively, of all fishers and fish farmers. Women make up at least 50 percent of the workforce in inland fisheries, while as much as 60 percent of seafood is marketed by women in Asia and West Africa. Moreover, although comprehensive data are not available on a sex-disaggregated basis, case studies suggest that women may comprise up to 30 percent of all those employed in fisheries, including primary and secondary activities. No single blueprint exists for closing the gender gap as yet, but some basic principles are universal. i.e,

• eliminate discrimination under the law, improving women's endowments, opportunities and agency to help shape more positive outcomes for the next generation;
• promote equal access to resources and opportunities, reducing barriers to more efficient allocation of women's skills and talents and helping to generate large productivity gains;
• ensure that policies and programmes are gender-aware, increasing women's individual and collective agency to produce better outcomes, institutions and policy choices;
• make women's voices heard as equal partners for sustainable development.

Empowering Fisherwomen, mainstreaming gender is an essential component of alleviating poverty, achieving greater food and nutrition security, and enabling sustainable development of fisheries and aquaculture resources. Gender considerations should be firmly placed on all fisheries and aquaculture policy agendas at all geographical and institutional scales.

Gender Mainstreaming:

"Gender mainstreaming is not only a question of social justice but is necessary for ensuring equitable and sustainable human development. The long-term outcome of gender mainstreaming will be the achievement of greater and more sustainable human development for all."(The United Nations Economic and Social Council (ECOSOC)1997,). The issue at hand is how to ensure genuine and active mainstreaming of gender and the many facets of gender considerations in the fisheries and aquaculture sector. Indeed, until recently, gender analysis in fishing communities focused mainly on the different occupational roles of men and women, i.e. that men usually do the actual fishing and women are to a large extent involved in post-harvest and marketing activities. While the role of women in the management and utilization of natural resources is generally acknowledged, their role does not carry the same weight as that of men. Given that production goals have tended to be the focus of research and policy, the predominantly male catching sector has remained the centre of attention. However, with the shift to a multidimensional and more holistic definition of poverty and the increased focus on reducing vulnerability, gender has become more central to fisheries policy and development practice. Fisheries resource management is increasingly being linked to all levels of the so-called "deck to dish" fish value chain in which both men and women have important roles to play. Gender-disaggregated data, which are needed for in-depth gender analysis are largely lacking in most of these countries. It is imperative that such data is collected, and gender research is conducted, so that appropriate interventions and policies changes are implemented, to ensure that women are not left out of mainstream development, and are accorded the basic rights, which all humans are entitled.

Conclusion:

There is an immense potential in fishery as a trade and livelihood option. The need of the hour is to develop sync between the two so that they reciprocate each other rather than come in conflict. The issues and concern of various players of the value chain need to be addressed so that they come in supportive mode rather than the exploitative mode. Here it is imperative to mention that environment will play a crucial role for success or failure of any intervention. Economic empowerment should be the end goal of a road map on gender in fisheries and aquaculture. The suggested approach could facilitate strong research and extension linkage and build partnerships with service-oriented private people like the farm opinion leaders, farmers' groups and fisheries professionals in the field, to streamline the fisheries and aquaculture in India. In view of the findings, it becomes imperative to scientifically educate and train women in specialized skill so that they too can improve and sharpen their skills and abilities for performance of tasks which need some technical knowledge and skill In view of the critical role of women in the agriculture as producers, concentrated efforts need to be made to ensure that benefits of training, extension and various programs reach them in proportion to their participation pattern. Strategies should be designed to enhance the capacity of women and empower them to meet the future participatory needs in farm operations. Special training programmes for women will enhance their skills and strengthen faith in them for effective and independent performance of farm operations and help them to make a shift from physically enduring operations to specialized tasks.

References:

- Ayyappan, S and Diwan, A D (2007) *National Fisheries Development Board and Fisheries Policy,***In**: Indian Fisheries: A Progressive Outlook. Vijayan, K K and Jayasankar, P and Vijayagopal, P,**(eds.)** CMFRI, Cochin, pp. 1-11. ISBN 978-81-901219-4-1
- DAHDF, 2011.
- Fabiyi, E.F.; B.B. Danladi; K.E. Akande and Y. Mahmood. 2007. Role of Women in agricultural Development and Their Constraints: A Case Study of Biliri Local Government Area, Gombe State, Nigeria. Pakistan Journal of Nutrition, 6(6): 676- 680.
- Goyal G, Randhawa V, Kaur R, Kaur V, Pannu K 2003. Women Participation in Agricultural Operations.*Journal of Family Ecology*, 5: 167-171.
- Jiggins, J.R.; K. Samanta and J.E. Olawoye. 1998. Improving women farmers' access to extension services: Food and Agriculture Organization of United Nations, Rome, pp. 73-82.
- MAFF. 1993. Outline of cooperative extension service in Japan. Ministry of Agriculture, Forestry and Fishries, Japan.
- Mies, Maria. 1986. Patriarchy and accumulation on a world scale. Women in the international division of labour.Zed Books, London.
- Reddy Gidda 2003.*Farming Performance of Farm Women 2003.* New Delhi: Concept Publishing Company.
- Saito K. and Spurling D, (1992).Developing agricultural extension for women farmers. World Bank discussion paper No. 156. Washington, USA.
- Sangwan V, Munjal S, Punia RK 1990. Participation of women in farm activities. *Indian Journal of Extension Education*, 26: 113-114.

Note: More References can be provided on request:

abhi34675@gmail.com

An unusual snack for cows, a powerful fix for climate

Tatiana Schlossberg

Feeding them seaweed slashes the amount of methane they burp into the atmosphere.

One of the most powerful weapons in the fight against climate change is washing up on shorelines around the world, unnoticed by most beachgoers.

It's seaweed.

Specifically, Asparagopsis taxiformis and Asparagopsis armata — two species of a crimson submarine grass that drifts on waves and tides all around the world's oceans.

It doesn't seem like much, but it could practically neutralize one of the most stubborn sources of a powerful greenhouse gas: methane emissions from the digestive processes of some livestock, including the planet's 1.5 billion cows, which emit methane in their burps.

Reducing methane from livestock and cows in particular, has long been a goal of scientists and policymakers but is especially tricky: How do you change a fundamental fact of animal biology in an ethical way that doesn't affect milk or meat?

In lab tests and field trials, adding a small proportion of this seaweed to a cow's daily feed — about 0.2 of a percent of the total feed intake in a recent study — can reduce the amount of methane by 98 percent. That's a stunning drop when most existing solutions cut methane by about 20 or 30 percent.

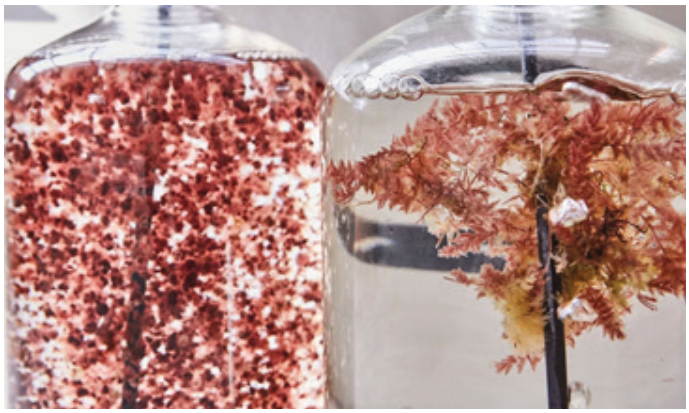
Meanwhile, growing seaweed used for the feed supplement could also help sequester carbon dioxide, another greenhouse gas, and reduce ocean acidification, because the plant sucks up carbon in the water as food.

Rob Kinley, the scientist who identified asparagopsis as a methane inhibitor, said it might just be the most promising way to eliminate methane emissions from livestock in the next decade.

That's significant because livestock overall account for about 15 percent of global greenhouse gas emissions, with nearly 40 percent of that linked to methane from the digestive process according to the United Nations' Food and Agriculture Organization. The amount of methane from livestock production alone is about the equivalent of the emissions from about 650 million cars.

In a study published in 2016, Kinley and his co-authors found that asparagopsis virtually eliminated methane emissions in lab trials. When a cow eats grass or other fibrous plants, microbes inside its rumen, or first stomach, use carbon and hydrogen from the fermentation of those plants to produce methane, which escapes from the cow mainly through burping, although about 5 percent is released through flatulence.

Asparagopsis and other types of seaweed have specialized gland cells that make and store bromoform, an organic compound. When the blurry red seaweed is freeze-dried, powdered and sprinkled as a garnish on a cow's meal, bromoform blocks carbon and hydrogen atoms from forming methane in the stomach.



Sea Forest grows asparagopsis, red algae, in its labs in Australia. When used as an additive to animal feed it is said to reduce methane production in livestock. (Sea Forest)

In response, the cow makes more propionate, a fatty acid that helps produce glucose in the metabolic process, allowing the animal to more efficiently grow or to produce more milk. That may enable farmers to use less feed and save money.

As it turns out, cows have been eating seaweed for probably as long as there have been cows, since they are, generally speaking, not picky eaters. Some evidence suggests that herders in ancient Greece fed their cows seaweed, as did many in 18th century Iceland.

The most recent effort began when Joe Dorgan, a farmer on Prince Edward Island in Canada, observed that his cows that grazed on seaweed that rolled up on beaches had better pregnancy success, produced more milk and suffered less from mastitis than cows that didn't eat seaweed.

Before Dorgan could sell the seaweed to other farmers, the Canadian government required proof that it was safe, said Kinley, who was then at Dalhousie University in Nova Scotia and was hired by Dorgan. Kinley and his colleague Alan Fredeen, published their results in 2014 and now Dorgan is part owner of North Atlantic Organics, which makes seaweed supplements for livestock.

Dorgan's seaweed reduced methane by about 18 percent, Kinley found in lab trials but suspected he could improve on that. "The light came on for me that there's probably Seaweed in the world that's better than that," said Kinley, who continued the work when he moved to Australia.

With scientists from Commonwealth Scientific and Industrial Research Organization (CSIRO) and James Cook University, Kinley identified asparagopsis as that seaweed, and determined that even proportionally small amounts of the stuff could produce significant climate benefits.

CSIRO licensed the use of asparagopsis as a feed supplement and founded a company, Future Feed, to manage its commercial use.

A number of companies have been working to make asparagopsis taxiformis and asparagopsis armata into commercial products that can be added to animal feed.

These companies are in various stages of production, with some using tanks on land to tinker with their seaweed strain before moving to grow in the ocean; others plan to always grow on land in tanks filled with ocean water and still more growing indoors. All are on the path toward commercialization, with one, Sea Forest, doing commercial trials with a wool producer and a dairy cooperative.

While their approaches differ, they share an urgency in getting asparagopsis to farmers, something they recognize is not easy. It's a challenge to figure out how to grow and process asparagopsis at scale and in a way that will translate into higher earnings for farmers.

"We've found something that's been under our noses the entire time that could have one of the greatest impacts on emission reduction in the next 10 years, which is cool for people to crack but not anyone can do it," said Sam Elsom, Sea Forest's chief operating officer. "It's not a gold rush."

Blue Ocean Barns, based in Hawaii, is backed by venture capital funds, which Joan Salwen, the company's CEO, says sets it apart.

"The capital that underpins our company is provided by a consortium of food companies including Starbucks and a number of others that are really interested in reducing the greenhouse gas emissions from their supply chains," she said. "They think that's imperative, and not an interesting little science thing or a climate thing. Their role as global leaders depends on their stepping up and using their power and influence to make a difference."

Dairy cows on a Minnesota organic dairy farm in October. (Bing Guan/Reuters)

Blue Ocean Barns is growing its asparagopsis in land-based tanks, using deep seawater to provide the right temperature and necessary nutrients. Although the seaweed is native to Hawaii, known as limu kohu, large-scale aquaculture could negatively impact the ocean ecosystem, Salwen said.

CH4 Global, which operates in New Zealand and Australia, takes a different approach. Its seaweed will be grown in the ocean, reducing energy needs, but also providing a benefit: The seaweed can help mitigate the problem of nutrient pollution from agricultural runoff because it eats nitrogen and can clean the water. It can perform the same function for fish farms — the asparagopsis eats excess nutrients resulting from aquaculture, allowing managers to increase density and raise more fish. As a result, CH4 Global is partnering with fish farms.

Steve Meller, one of the founders and CEO said CH4 Global is unique because three of its five founders are Maori and the company is working with Indigenous groups in Australia and New Zealand. It signed an agreement with the Narungga Nation in South Australia to build "the world's first commercial scale asparagopsis aquaculture and processing facility," Meller said.

"These are the folks who have lived on the land for 50,000 continuous years in the spot where we want to do some work, so it is natural for us to partner and drive that value and that has always been part of our plan," he said.

All four CEOs interviewed said they needed buy-in from farmers, not only because they need customers, but because of the urgency of the climate crisis, and what they believe is the power of their solution. They say their supplement could allow farmers to sell their products at a premium, using climate and other environmental benefits as a marketing point.

"We want to put money in farmer's pockets," Meller said, adding that his company plans to pay farmers for their methane reduction by buying carbon credits from them. "Dairy farmers and beef farmers are under enormous financial pressures, with some of the highest suicide rates and an enormous number of bankruptcies," he said. Last year, an estimated 10 percent of Wisconsin's dairy farmers were expected to file for bankruptcy and the rest continue to struggle against the corona virus crisis this year.

Another company, Symbrosia, is in the trial stages and hopes to offer carbon offsets to consumers who want to help reduce methane emissions through asparagopsis feed. Through its website, the company is selling carbon offset subscriptions, which will help pay for the implementation of a seaweed program on a cattle or sheep farm, said Alexia Akbay, one of the company's founders and CEO.

The power of the asparagopsis seaweed as a climate solution appeals to Akbay, who also appreciated that it was tapping into technologies that already exist in nature.

There is an inherent tension in this solution, as with so many others: If the main climate impact of cattle production has been removed, people might eat even more beef and dairy because they feel less guilty. And that might be okay, as long as methane emissions can be brought down, Akbay said.

"Instead of banging my head against the wall and trying to get people to become vegetarian, which I've done," she said, laughing, "we could try to trick the system."

Postal Regn. No. HD/1068/2018-20
Published on 7 January 2021