

## Inside...

Editorial:  
Union Minister for  
Fisheries, Rajiv Ranjan  
Singh launches  
AmritCatla...



A.V. Subramanyam

Deepak Nexgen aims  
at 400,000 tons Fish  
and Shrimp feed sale in  
2024 – 2025

Govt's power policy,  
no subsidy: Why area  
under shrimp farming is  
decreasing in Punjab?

Satellite Symposium on  
Nutrition and Feeding  
in Aquaculture as a  
part of SFARM-2024

Spotted Scat fish  
(Scatophagus argus):  
A potential species...

Experimental Learning  
Programme (ELP):  
An Approach towards  
Developing Skilled  
Professionals.

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## CONTENTS

### Editorial

11. Union Minister for Fisheries, Rajiv Ranjan Singh launches AmritCatla, a genetically improved variety of Catla (Labeo catla) at ICAR-CIFA, Bhubaneswar.

### News

14. Bühler India launches new SmartLine solutions for the growing biscuit and cracker market.
16. G20 backs FAO's Blue Transformation for sustainable fisheries, aquaculture.



18. Satellite Symposium on Nutrition and Feeding in Aquaculture as a part of SFARM-2024.
26. Pursuit of profits by big supermarkets pushing shrimp farmers into exploitation, research reveal.
30. Govt's power policy, no subsidy: Why area under shrimp farming is decreasing in Punjab?

31. Union Minister Shri Rajiv Ranjan Singh releases the "Amrit Catla" at ICAR-CIFA, Bhubaneswar.

### Special Feature

36. Deepak Nexgen aims at 400,000 tons Fish and Shrimp feed sale in 2024 – 2025.

42. Perils of Ammonia.

### Articles

48. Spotted Scat fish (Scatophagus argus): A potential species for brackishwater aquaculture and aquarium trade.
50. Experimental Learning Programme (ELP): An Approach towards Developing Skilled Professionals.
54. Role of Binder Feed Gels as Growth and Health Agents for Profitable Aquaculture.
56. Extraction and Uses of bio-diesel from fish waste.
60. The Economic Impact of Sustainable Fishing Practices: Balancing Conservation and Profit in Global Fisheries.

## ADVERTISERS' INDEX

Angel Yeast Co Ltd	BC	Megasupply Co.	6
Biochem	3	Microbasia	57
Buhler (India) Pvt Ltd	13	Nandini Gears	7
Camlin Fine Sciences Ltd	35	Nihal Traders	28
Deepak Nexgen Foods & Feeds Pvt Ltd	17	Phileo by Lesaffre	21
Doctor's Vet-Pharma Pvt Ltd	23 & 25	Poseidon Biotech	5
Famsun Co Ltd	10	Salem Microbes Pvt Ltd	32 & 33
FECPI India Pvt Ltd	29	Serworld	45
Guangzhou Tinder Industry Co Ltd	4	Skretting India	59
Golden Marine Harvest	8	Sribs Biotechniqs Pvt Ltd	2
Golden Marine Biotechnologies Pvt Ltd	40 & 41	Team Agrotech Pvt Ltd	19
HiMedia Laboratories Pvt Ltd	34	The Waterbase Limited	FC
Hitech Life Sciences Pvt Ltd	27	Uni-President Vietnam Co. Ltd	15
K.G.N. Hatchery	63	Zhanjiang Hengrun Machinery	46 & 47

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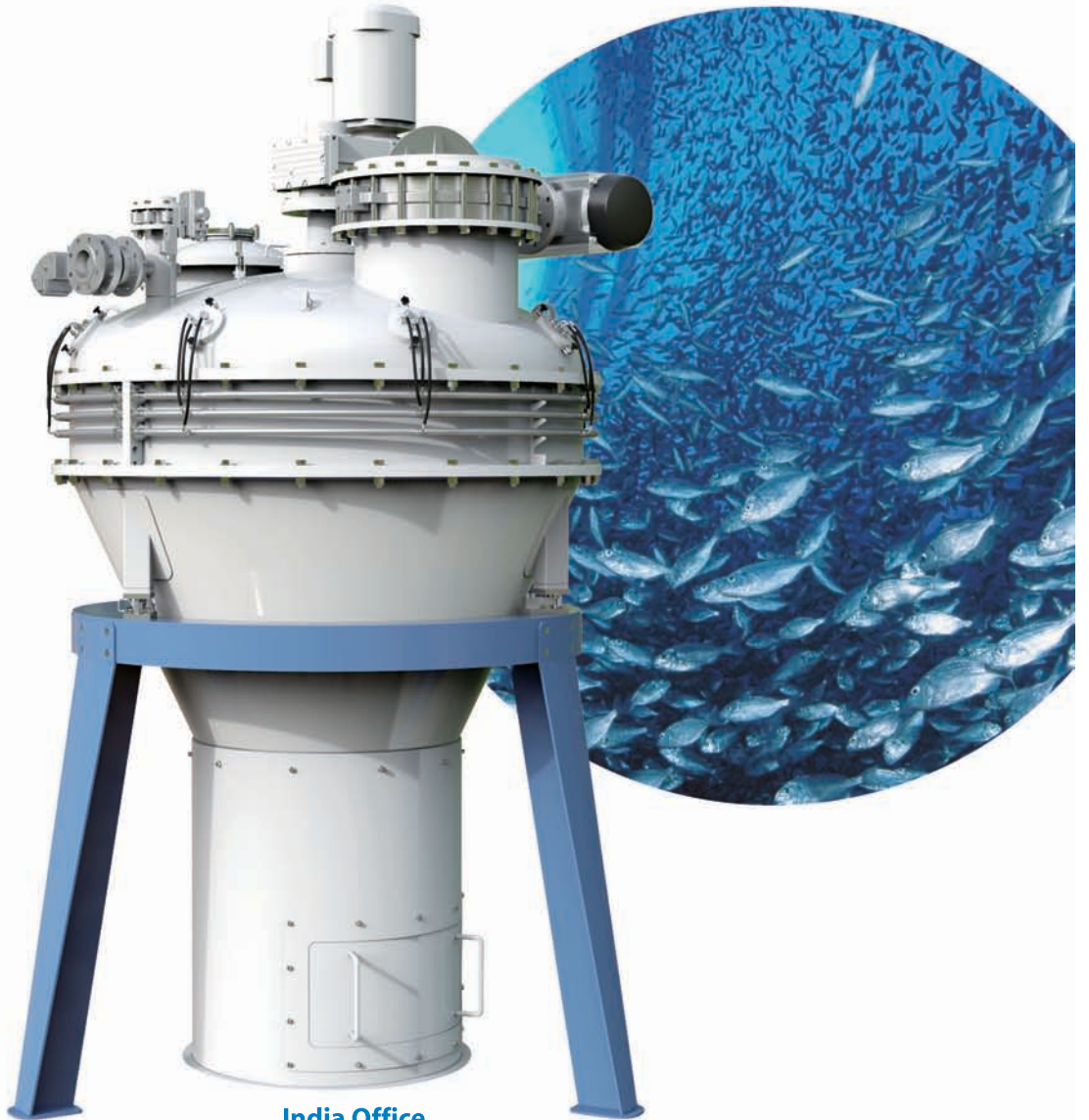


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## Union Minister for Fisheries, Rajiv Ranjan Singh launches AmritCatla, a genetically improved variety of Catla (Labeocatla) at ICAR-CIFA, Bhubaneswar

*Role of Binder Feed Gels as Growth and Health Agents for Profitable Aquaculture, good aquaculture practices are the decision factors of a healthy and profitable aquaculture system. Good water, feed and disease management play a crucial role in the growth, survival and production. For this efficient management, an effective solution that balances the growth, health and production in terms of the nutrients with the perfect ingredient formulation, absorptions and assimilation is the essentiality for the success of aquaculture operations.*



Dear Readers,

The October 2024 issue of Aqua International is in your hands. In the news section, you may find news about....

**CLFMA of India**, a non-profit organization and the apex body representing the "One Voice" of the livestock industry, announced its newly elected leadership team for the term 2024 - 2026. Established in 1967, CLFMA has played a pivotal role in promoting the animal husbandry sector, focusing on balanced animal nutrition to enhance productivity. Since 2002, it has grown to represent a diverse membership of over 250 stakeholders, including dairy, poultry and aquaculture sectors, as well as feed additives manufacturers, breeders, integrators and vaccine producers.

As a part of this Conference, the Satellite Symposium titled 'Nutrition and Feeding in Aquaculture' was organized on the third day, 14 September 2024. The Plenary Lecture was given by Dr S. S. Giri, Principal Scientist, ICAR-CIFA, Bhubaneswar. Dr A. K. Ray, Retd. Professor of Zoology, Visva-Bharati and Dr S. J. Kaushik, Director of Research (Retd.), INRA, France were the Chairpersons. Dr Giri spoke about status of aqua feeds in India; that locally-available feed ingredients should be brought into formulation; different types of feed formulations developed by ICAR-CIFA and demonstrated to farmers in villages; fish feeds developed by different ICAR institutes in different aquaculture systems;

farmers could be made aware that fishes require food to grow; current innovations in fish feed (use of sustainable and alternate feed ingredients); Govt of India support and policy on fish feed; high performance feed formulations; nutrient requirement of finfish and shellfish published very recently by ICAR in 2024; publication on nutrient composition on Indian feed and fodders; nutritional programming of fish feed - towards high profitability and consumers benefit; developing responsive feed formulations that provide cost-effective solutions to fish farmers.

**Deepak Nexgen Feeds Pvt Ltd targets** to achieve 20% market share in the 12 lakh tons Indian Shrimp feed market. The company claims No.1 position in fish feed sale in India with 20% market share of 10 lakh tons Fish feed market. Deepak Nexgen has 560,000 tons fish and shrimp feed production capacity. Also targets to achieve Rs 2600 crore turnover in 2024 - 2025.

**Pursuit of windfall profits** by big Western supermarkets on the back of low wholesale prices is causing widespread labour exploitation in the shrimp aquaculture industries of Vietnam, Indonesia and India, a new investigation published by AP, has found. The investigation conducted by an alliance of non-governmental organisations (NGOs) and the findings provided to the publication, focussed on the three countries which are among the largest producers of shrimp. The analysis reveals that producers supplying shrimp to top global markets - the United States, the European Union, the United Kingdom and Japan - have seen earnings drop by as much as 60% from pre-pandemic levels.

*Contd on next page*



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.

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Tel: +91 040 - 2330 3989, 96666 89554. Website: [www.aquainternational.in](http://www.aquainternational.in)

**Johannes Wick, CEO of Grains & Food at Bühler Group**, says, “In a world of rapidly changing requirements, customers need flexibility and creativity to adapt their products to key issues such as healthy diets, affordability, the use of local raw materials and sustainability. This prompted our decision to continue investing in this market and to support our customers in their innovation journeys.”

**Saroop Singh Sandhu**, 40, started shrimp farming in 2017 in 2.5 acres of his total 15-acre land in Ratta Tibba village in Muktsar Sahib. He had tried fish farming in 2012 but was unsuccessful. Shrimp farming, however, proved more lucrative, bringing in profits of Rs 1.5 to Rs 2 lakh per acre. Encouraged, he Saroop expanded his shrimp farm to 35 acres. All was going well till 2021 but in 2022, the government changed its power policy for shrimp farmers and started charging Rs 7 per unit. He has now reduced his shrimp farming to just 15 acres.

**Union Minister for Fisheries**, Animal Husbandry and Dairying and Panchayati Raj, Mr Rajiv Ranjan Singh alias Lalan Singh, launched “AmritCatla,” a genetically improved variety of Catla (Labeo catla), at the ICAR-Central Institute of Freshwater Aquaculture (ICAR-CIFA), Bhubaneswar. The National Freshwater Fish Brood Bank (NFFBB) of the National Fisheries Development Board (NFDB) received the AmritCatla, ensuring its wider distribution and availability for farmers across the country. This development represents a significant milestone in freshwater aquaculture and aligns with the institute’s efforts to enhance fish seed quality for India’s growing fish farming community.

**In the Articles Section, Extraction and Uses of bio-diesel from fish waste** authored by B. Deepika, J.I.Bavithra, S. Esther Jona and P. Ganesan Department of Fish Processing Technology Fisheries College and Research Institute. The consumption of fossil fuel-based oils have been increasing in recent years, because of the increasing human population and rapid industrialization. The bio-diesel is used as an alternative source of petroleum-based fuel, because it is renewable biodegradable, non-toxic and can solve the energy related problems by mainly reducing the emission of gases which lead to global warming. The demand for fossil fuels in sectors such as heat and power generation is continuously threatening global energy sustainability. The introductions of internal combustion engine and transportation sector are leading to the depletion of petroleum reserves at a faster rate. Moreover, the combustion of fossil fuels results in environmental pollution.

**Another Article titled, Spotted Scat Fish** authored by E. Suresh, N. Kalaiselvi and N.Hemamalini they have a small, horizontal mouth which is not protractile. There are a number of rows of small bristle-like teeth in the jaws. The dorsal fin has 10-11 spines and 16-18 soft rays, while the anal fin has 4 spines and 13-15 soft rays. The spines and rays of the dorsal fin are separated by a deep notch and the first spine in the dorsal fin lies flat. The rear margins of the soft parts of the dorsal and anal fins are roughly vertical. The caudal fin is rounded in juveniles and truncate to weakly emarginate adults. Small ctenoid scales cover the body. Spotted Scat fish are easily recognizable by their distinctive coloration and markings. The body is greenish-brown to silvery with many browns to red-brown spots. Juveniles are a greenish-brown with either a few large, dark, rounded blotches, or five or six dark, vertical bars. This species attains a maximum total length of 38 cm (15 in). In large adults, spots may be faint and restricted to the dorsal part of the flanks.

**Another Article titled Experiential Learning Programme (Elp)** authored By Lokesh Pawar and Priyabati Devi Brahma charimayum stated, the Indian Council of Agricultural Research introduced the experiential learning programme (ELP) into the curriculum of under graduate programmes in fisheries, veterinary, agriculture, horticulture, and other allied fields as one of the components under the students READY (Rural Entrepreneurship Aware) initiative in response to the nation’s constantly growing population and the community of unemployed people’s growth with the limited quota of government jobs (both state and central). “To prepare students to become job providers rather than job seekers” was the slogan. Thus, the curriculum places a strong emphasis on the value of helping students adopt an entrepreneurial attitude. Typically, the ELP is held during the second to last semester of the undergraduate curriculum. A programme called experiential learning is founded on the ideas of “Learning by doing” and “Seeing is believing.”

**Another Article titled, Role of Binder Feed Gels as Growth and Health Agents for Profitable Aquaculture** authored by Dr Sujani Gudipati, good aquaculture practices are the decision factors of a healthy and profitable aquaculture system. Good water, feed and disease management play a crucial role in the growth, survival and production. For this efficient management, an effective solution that balances the growth, health and production in terms of the nutrients with the perfect ingredient formulation, absorptions and assimilation is the essentiality for the success of aquaculture operations.

**Another Article titled, The Economic Impact of Sustainable Fishing Practices** authored by Tenji Pem Bhutia, Ravi Shankar Kumar and Saba N.Reshi stated, the oceans are essential for both the environment and global economies, with fisheries playing a critical role in food security and livelihoods. However, overfishing and habitat destruction have severely depleted fish stocks, threatening marine ecosystems and communities dependent on fisheries. Sustainable fishing, which balances conservation with economic gain, is essential for long-term viability. Key strategies include setting catch limits, reducing bycatch, imposing fishing bans and protecting habitats as it will help replenish fish populations and promote biodiversity. Economic benefits of sustainable fisheries include stable fish stocks, increased market access, job creation, and enhanced profitability. With rising consumer demand for sustainable seafood, adopting sustainable practices is not only environmentally necessary but also economically advantageous.

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

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## Bühler India launches new SmartLine solutions for the growing biscuit and cracker market

Bengaluru (India), August 13, 2024 – Bühler India has launched two solutions that will enable biscuit manufacturers to provide a diverse range of products to their customers, addressing the growing demand in the region. As part of the SmartLine series, the DirectBake Smart is a Direct Gas Fired (DGF) oven that can accommodate a diverse range of baking needs with ease, while the RotaMold Smart is a rotary molder that produces a wide variety of shapes and intricate designs. Both solutions incorporate Bühler's cutting-edge technology and are reliable, versatile, and efficient. This launch is a testament to Bühler's "Make in India" initiative and built on the company's long-standing expertise in manufacturing grain and food processing solutions in India since 1993.

Whether it is molded biscuits, crackers, or Marie biscuits, the DirectBake Smart oven can produce a diverse range of baked goods with Bühler's state-of-the-art heat transfer technology. It has a recipe-controlled burner system to ensure optimum operational parameters, which also makes it easy to change the product as required.

The DirectBake Smart oven is part of a global collaborative development



program within Bühler with the focus on designing and manufacturing products in the region. It is designed and produced in India. Until now, Bühler India has only manufactured the ovens that were designed in Denmark.

The RotaMold Smart is another innovative and affordable product now available to customers in India. It molds each biscuit

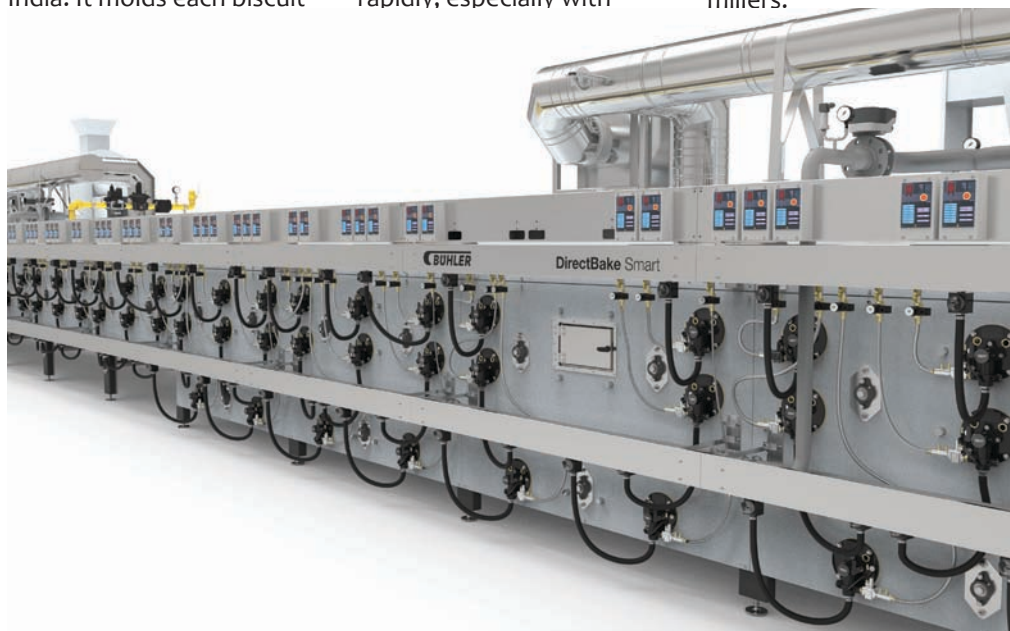
to the exact shape and size required, ensuring consistency across the entire batch. It can also produce an extensive variety of shapes and intricate designs, allowing manufacturers to offer a diverse range of biscuits.

Ajith Dharan, Head of Consumer Foods Business, Bühler India, says, "The biscuit industry in India is substantial and growing rapidly, especially with

the expansion of both domestic and international brands. To meet this increasing demand, we are launching these solutions at our facility in Bengaluru. With this approach, we are providing innovative and affordable technology that is commercially attractive for the Indian market."

### Flourishing industry

India is the third-largest producer of biscuits, and the industry is growing at an average Compound Annual Growth Rate (CAGR) of 5-6%. "In this fast-paced life where convenience is key, cookies and crackers are set to be the drivers for new growth, with variety and product differentiation not far behind," says Prashant Gokhale, Managing Director, Bühler India. "Our target audience is primarily biscuit customers who want to have superior baking technology at competitive prices. With this launch, we are offering forward integration possibilities for our flour millers."



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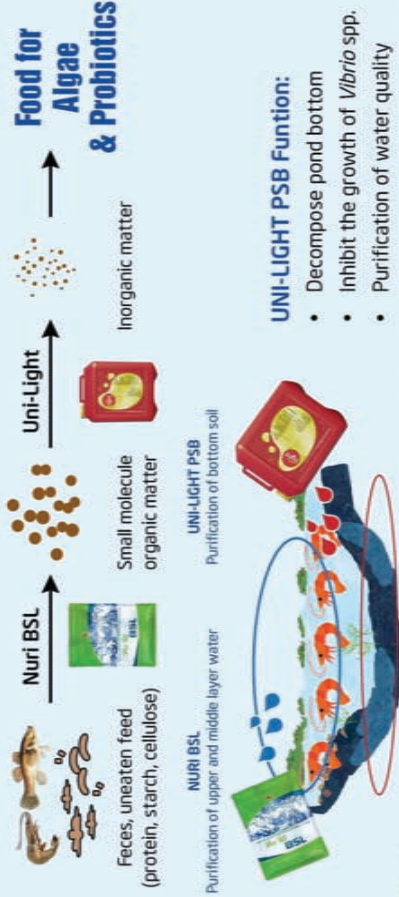
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7 days before stocking	800 g - 1,000 g	1,200 - 1,500 g	1,200 - 1,500 g
Day of stocking	300 g - 500 g	800 g - 1,000 g	800 g - 1,000 g
Every 7 - 10 days after stocking	300 g - 500 g	800 g - 1,000 g	800 g - 1,000 g

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

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DirectBake Smart

Bühler has committed to a 60% reduction in the Scope 1 and 2 greenhouse gas emissions in its operations by 2030 against its 2019 baseline. In line with this, the production facility in Bengaluru is designed to use less water and incorporate renewable energy such as solar power and natural daylight, thereby reducing its carbon footprint.

Johannes Wick, CEO of Grains & Food at Bühler Group, says, "In a world of rapidly changing requirements, customers need flexibility and creativity to adapt their products to key issues such as healthy diets, affordability, the use of local raw materials, and sustainability. This prompted our decision to continue investing in this market and to support our customers in their innovation journeys."

#### About Bühler

Bühler is driven by its purpose of creating innovations for a better world, balancing the needs of economy, humanity, and nature in all its decision-making processes. Billions of people come into contact with Bühler

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## G20 backs FAO's Blue Transformation for sustainable fisheries, aquaculture

*FAO Blue Transformation strategy aims to ensure aquatic food systems continue feeding the world's growing population*

The Food and Agriculture Organisation of the United Nations (FAO) welcomed the inclusion of fisheries and aquaculture and family farming in this year's G20 priorities, emphasising their essential role in global nutrition and livelihoods.

Speaking at the G20 Agriculture Ministers' Meeting in Mato Grosso, Brazil, FAO Director-General QU Dongyu stressed the need for sustainable growth in the fisheries and aquaculture sectors to meet rising global food demand and address nutritional deficiencies, particularly in developing countries.

"The FAO Blue Transformation strategy aims to ensure aquatic food systems continue feeding the world's growing population," he said.

The G20 Agriculture Working Group Ministerial Declaration, agreed upon this week, officially recognised FAO's Blue Transformation Roadmap 2022-2030 as a key framework for achieving long-term sustainability in the fisheries and aquaculture sectors. The declaration also highlighted important FAO instruments, such as the Guidelines for Sustainable



Aquaculture, the Guidelines for Sustainable Small-Scale Fisheries, and the Agreement on Port State Measures.

Aquatic foods currently provide more than 3.3 billion people with at least 20 percent of their average per capita animal protein intake, along with critical bioavailable micronutrients. Aquaculture is also the world's fastest-growing food production sector. Aquatic foods support around 600 million livelihoods, and the total first stale value of the sector was a record USD 472 billion in 2022.

"FAO looks forward to working with G20 members in a Blue Transformation and in the lead-up to the 2025 UN Oceans Conference," he added.

Courtesy: [business-standard.com](https://www.business-standard.com)





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# Satellite Symposium on Nutrition and Feeding in Aquaculture as a part of SFARM-2024

The 2<sup>nd</sup> International Conference and Exhibition on 'Sustainable Fisheries & Aquatic Resource Management: Life Below Water' (SFARM-2024) was organized by the Central Calcutta Science & Culture Organization for Youth, Kolkata during 12<sup>th</sup>-14<sup>th</sup> September, 2024 at Science City, Kolkata, West Bengal in cooperation with Ministry of Fisheries, Animal Husbandry & Dairying, Govt of India, other Ministry(s) of Govt of India, West Bengal Fisheries Department. Participants in this grand



**Dr T. K. Ghoshal,**  
3rd Lead Lecture

programme included senior fishery & aquaculture experts, Scientists from ICAR fishery institutes, PhD research scholars and Professors from Calcutta University, WBUAFS, University of Burdwan, Vidyasagar University, The Neotia University, Kalyani University, North Bengal University, WB State University, college teachers, participants from other states, experts/



## Valedictory Session of the Conference

delegates from Bangladesh and other countries. There were Key Note Address, Lead Lectures, Plenary Lectures, Oral and Poster Presentations in seven different Technical Sessions in this 3-day Conference.

As a part of this Conference, the Satellite Symposium titled 'Nutrition and Feeding in Aquaculture' was organized on the third day 14<sup>th</sup> September, 2024. The Plenary Lecture was given by Dr S. S. Giri, Principal Scientist, ICAR-CIFA, Bhubaneswar. Dr A. K. Ray, Retd. Professor of Zoology, Visva-Bharati and Dr S. J. Kaushik, Director of Research (Retd.), INRA, France were the Chairpersons. Dr Giri spoke about status of aquafeeds in India; that locally-available feed ingredients should be brought into formulation; different types of feed formulations developed by ICAR-CIFA and demonstrated to farmers in villages; fish

feeds developed by different ICAR institutes in different aquaculture systems; farmers could be



**Dr S. S. Giri, Plenary Lecture**

made aware that fishes require food to grow; current innovations in fish feed (use of sustainable and alternate feed ingredients); Govt of India support and policy on fish feed; high performance feed formulations; nutrient requirement of finfish and shellfish published very recently by ICAR in 2024; publication on nutrient composition on Indian feed and fodders; nutritional programming of fish feed

- towards high profitability and consumers benefit; developing responsive feed formulations that provide cost-effective solutions to fish farmers.

Dr Giri also spoke about broodstock feed and larval feed, that 39 big fish feed mills are running now in India and few hundreds of small-scale feed mills; issues and challenges in aquafeeds (fast growth of aquaculture sector puts pressure on increased supply of marine/terrestrial feeds, price fluctuation of ingredients affects feed prices and feed markets, and others); opportunities in aquafeed market and industry. We should educate fish farmers about the utility of using pelleted feed instead of submerged bag feeding technique (where FCR is high); promotion of farm-made feed without need of extruding. According to Dr Giri, continued investment in R & D is needed to explore sustainable feed resources and formulation of region-specific fish feeds that reduce feed costs and demands. Large fish farmers should be educated on the benefits of using pelleted feeds, for better resource management and addressing future challenges of feed scarcity. Small fish farmers should be empowered with knowledge of the importance of feeding in aquaculture and training them to prepare their own feeds. Enhancing natural pond productivity is also important to reduce feed usage and also production costs.

First Lead Lecture was given by Dr B. N. Paul,





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**Dr S. Munilkumar,  
5th Lead Lecture**

Principal Scientist, ICAR-CIFA Rahara Centre on 'Farm-made feed for small scale aquafarming'. He spoke about segments of feed usage in Indian aquaculture out of total 20 million tonnes; potential fish feed ingredients - plant sources and animal sources; brewery wastes, ghee residue, dried distillery grain soluble and jute leaf powder as new feed ingredients; proximate composition of agro-industrial byproducts; thumb rule of farm-made feed; formulations of six different kinds of grow-out farm-made carp feed; equipments used for farm-made feed preparation; his demonstrations on farm-made fish feed at village ponds of Odisha, Nagaland and Ramkrishna Mission Belur Math, West Bengal. According to him, in general feed may be given @ 1-2% of fish body weight in grow-out major carp ponds at particular time and place daily but less than 1% in November and December. Wheat flour (Maida) and commercial Vit-Min should be given @ 2% each in feed mix. Feeding after grinding and pulverization of ingredients are useful than simple rice bran - mustard oil cake mix as moist dough balls. High

content of omega-3 fatty acid in linseed sludge, low cost, can be incorporated into farm-made feed. Feed based aquaculture (not only natural food in ponds) is the alternative to increase fish production to meet future demand and improve livelihood. Sorghum, maize, rice bran, wheat bran, grain milling waste are carbohydrate sources in feed. As the price of manufactured aquafeed is soaring, small and marginal farmers should feed fish with farm-made feeds with locally-available cheap feed ingredients for aquaculture sustainability. Small hand pelletizer and electricity operated pelletizer play significant roles in farm-made feed manufacturing.



**Dr K. Ghosh, 7th Lead Lecture**

Second Lead Lecture was given by Dr D. De, Principal Scientist, ICAR-CIBA, Kakdwip on 'Cost-effective feed development for farming brackishwater finfish and shellfish'. He spoke about 25 functional aqua feed mills in Andhra Pradesh (out of 35 in India); major candidate foodfish, shellfish and ornamental fish for brackishwater aquaculture; total aquaculture production of shrimp being 8.52 lakh tonnes in 2020-2021 in India of which *Litopenaeus*



**Dr K. Mondal, 4th Lead Lecture**

*vannamei* production is 8.16 lakh tonnes; that process of feed technology development begins with nutritional requirements of the species, testing in yard trial and other process, finally given to interested fish farmers; indigenous feed technologies for brackishwater shrimp and fish developed by CIBA; key factors for cost-effective feed formulation; salient features of larval feed for shrimp and sea bass, 'vanami' feed, polyculture feed, sea bass grow-out feed (after weaning the fish to feed), grey mullet broodstock feed, pearl spot maturation diet, broodstock Hilsa feed, 'CIBA Plankton plus', plankton technology to convert fish waste to wealth. Dr De emphasized on less dependency (reduced reliance) on wild marine fish and fish meal for aquafeed. According to him, majority of feed used in brackishwater aquaculture sector is scientifically formulated compounded feed produced by multinational Indian company. India's aquafeed production (both extruded and non-extruded feed) is estimated to be around 3 million tonnes annually, and 8-9 million tonnes of farm-made feed. It is estimated that

about 20 million tonnes of aquafeed is required by the year 2025. He spoke about resource available for brackishwater aquaculture in 3 districts of West Bengal, area under scientific *Penaeus monodon* and *L. vannamei* farming in the districts.

Third Lead Lecture was given by Dr T. K. Ghoshal, Principal Scientist & Head, ICAR-CIFE Kolkata Centre on 'Relevance of farm-made feed in aquaculture and its promotion'. He stated that much emphasis given to aquaculture by Govt of India, separate Ministry created; that multinational companies are coming to produce fish feed but equal importance should be given to farm-made feed prepared



**Dr J. Maity, 6th Lead Lecture**

by fish farmers; locally-available conventional feed ingredients (cotton seed oil cake used by industry); deoiled rice bran (DORB) required for biscuit industry also besides in making fish feed; black soldier fly meal, silkworm pupae meal, chicken feather meal, Brewer grain meal as unconventional feed ingredients; leaf meals tested as fish feed ingredient at CIFE; ground nut leaf meal contain good amount of protein,



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**Dr D. De, 2nd Lead Lecture**

as alternative to DORB; possible approaches to reduce feed cost of farm-made feed; specific feed formulation for target species; tapioca flour, mango seed kernel, deoiled Karanja cake as cheap ingredients. About 10 million tonnes of farm-made feed is used by fish farmers every year in India. There should be availability of machineries like grinder and micro-pulverizer. Farmers could prepare feed @ 100-200kg / day using simple machineries; which are mostly not available these days in market. Farmers may buy good pelletizer machine costing Rs 3-4 lakh to convert farm-made feed into pelleted feed. Unit cost of machine is Rs 14-15 lakh developed at CIBA, Kakdwip for producing 1000kg feed / hour. Capacity of grinder should be in tune with that of pelletizer. Majority of small and medium-scale fish farmers use low quality farm-made feed for carp culture, with comparatively less production. Dr Ghoshal highlighted the approx. cost of components (basic machineries - grinder, pulverizer, mixer, pelletizer, cooker, dryer) for establishing farm-made feed plant, having capacity 150-200kg/day pellet production for finfish or shrimp. We have to advocate good

knowledge and about machineries to farmers so that good pelleted feed produced having good water stability, think about benefit of farmers who are ultimate users of feed. Further research needed to make farm-made aquafeed economical and sustainable.

Fourth Lead Lecture was given by Dr K. Mondal, Professor of Zoology, Kalyani University on 'Use of probiotics, trace minerals and plant extracts as nutritional supplements for sustainable aquaculture management'. He spoke about feed additives and supplements (phytochemicals, plant extracts, minerals, antibiotics); development of anti-microbial resistance in bacteria (drug-resistant strains) pathogenic to fishes; feed sources for aquaculture - natural, conventional (animal and plant origin), non-conventional ones (duckweed, silkworm maggots, etc); feed probiotics and water probiotics; fish gut, domestic animal gut, seawater as sources of probiotic bacteria; medium of probiotic delivery in farmed fishes. Dr Mondal also highlighted on effects of probiotics on pathogenic bacteria and the mechanism of action; application of probiotics in aquaculture; that probiotics can prevent the disease and should not be used for disease treatment; roles of probiotics, micro-nutrients, minerals, trace minerals in aquaculture; nanominerals as disease-controlling system that should be between 50-100 micron particle to get



**Dr B. N. Paul, 1st Lead Lecture**

absorbed in fish intestine effectively.

Dr Mondal spoke about his research studies on biogenic synthesis of zinc oxide nanoparticles where *Aloe vera* was used for its preparation, its experimental results, application of the nanoparticles for antibacterial activity in fishes. He spoke on medicinal plant extracts (flavonoids, phenols, tannin, alkaloids) in aquaculture as growth promoter, anti-stress and immuno-modulators; advantages of herbal products as immuno-stimulants; mode of action of medicinal plant extracts, working efficiency of Aswagandha, Bhui kambal, neem, guava, garlic extracts in diet of fishes; advantages of combined application of

probiotics (isolated from gut of *Cyprinus carpio* and other carps), minerals and medicinal plant extracts in cultured fish diet in grow-out ponds. Supplementation of probiotics, nanominerals and phytobiotics in fish diet could significantly promote growth performance, enhance digestive enzyme activity and disease resistance capacity of farmed fishes.

Fifth Lead Lecture was given by Dr S. Muniikumar, Principal Scientist, ICAR-CIFE Kolkata Centre on 'Future of live food culture in Indian aquaculture'. He stated that along with global population increase, there has been pressure to enhance and optimize fish production from less resources. He spoke about species diversification in aquaculture towards increased production; lack of quality seed production capability, larval rearing and husbandry practices as challenges that prevent species diversification; need of live food for different species at their first stage of growth (first feeding) or initial larval culture; successful weaning of new fishes to



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artificial diets; live food Vs artificial feed. India currently relies on import of live fish food *Artemia*, polychaetes which are expensive and subjected to supply chain disruptions. He highlighted about his metagenomic studies, i.e., microbiome manipulation to understand the role of microbiome in improving the health and growth of live food. As future directions, we should think about alternative live food species that might be more nutritious, easily culturable, or more resilient to environmental changes as more efficient organisms. He also spoke about nutritional optimization for enhancing the nutritional profile through the use of encapsulation techniques; automation and AI integration for decision-making for feeding regimes, water quality management, disease prevention; integrated multi-trophic aquaculture as a sustainable production practice based on circular economy principles; weaning strategies, breeding and seed production of new fishes like loaches with use of rotifers. By promoting research into local production of live food, India can reduce its dependency on imports, lower costs for seed production, increase sustainability of aquaculture sector, create new opportunities for fish farmers.

Sixth Lead Lecture was given by Dr J. Maity, Associate Professor of Zoology, Vidyasagar University on 'Aquafeed development and feeding management for



**Dr A. Sinha, 8th Lead Lecture**

sustainable aquaculture - present and future'. He stated that gaining more knowledge about fish nutrition is a priority, that will aid in developing and improving sustainable aquaculture practices. Present Indian aquaculture production is 10 million tonnes, the current level of feed requirement in aquaculture sector is 15 million tonnes. We should develop species-specific and system-specific feed; concepts of larval, nursery, grow-out, broodstock, finisher, medicated, organic and climate-smart feed are important. Formulation of cost-effective fish diets that endorse good production while maintaining fish health and well-being. Byproduct of a material, generally thrown away, can be thought about its incorporation into fish feed. He spoke about nutritional requirement of different fishes; implementation of suitable feeding methods and economical feeding strategies in aquaculture ponds; carotenoid pigments that may be incorporated into feeds. Huge amount of dry flowers (marigold, china rose) thrown away after Durga Puja festival, their components can be made into use in ornamental fish feed. Processed petals of red Palash flower can be used. Correct amount

of estimated feed should be applied. Managing fish wastes is important, drone (AI)-based feeding technology have been introduced in some places outside West Bengal.

Seventh Lead Lecture was given by Dr K. Ghosh, Professor of Zoology, University of Burdwan on 'Probiotics, prebiotics and post-biotics - the changing scenario of aquafeed technology'. He mentioned that along with more thrust on aquaculture, the stocking density is increased, that leads to creation of stress, finally reduced feed utilization, weakened immune system on the part of fishes under culture, poor growth and disease outbreak. Here lies the implication of feed additives. Commercial prebiotics like FOS, GOS, inulin, pectin are costly for fish farmers, but *Asparagus sp*, *Moringa sp*, banana can be used in fish feed. Functional characteristics, biosafety and stability in fish GI tract are the selection criteria of probiotic organisms. Not all prebiotics (as carbon source in growth medium of probiotics) can stimulate the growth of all probiotic bacteria. Dr Ghosh studied and observed that FOS could stimulate *Bacillus licheniformes* and inulin could stimulate *B. methylotropicus*. He also studied inhibition zone produced against pathogen *Aeromonas sp* by the cell-free supernatants of probiotics grown in presence of prebiotics. Prebiotics could not stimulate growth of pathogenic organisms when used in culture medium of *Aeromonas sp*.

Combination of FOS and *B. licheniformes* significantly increased feed utilization, weight gain, growth of fish. Prophylactic application of synbiotic was good, could show high fish survivability after challenge with *Aeromonas sp*. The synbiotic formulation Moringa leaves + probiotic consortium did improved fish carcass composition in Rohu when used as dietary supplementation. FOS and Mannan-oligosaccharide are present in *Moringa sp*. Fish farmers could be managed to understand about its importance, validation of synbiotic done in farmer's composite fish culture pond (field trial). As proposed synbiotic formulation, spore culture of live bacteria + prebiotic source in powdered form was used. It worked better in terms of fish growth. Digestive enzymes studied in these fishes. He said that functional feed additives and application of probiotics and synbiotic formulation can change the scenario of Indian



**The Satellite Symposium on 14th September 2024**



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aquaculture, decreasing disease susceptibility, improve growth and nutrient utilization in IMC. Dr Ghosh's research findings were mentioned in Page 18-19, September 2024 issue, Aqua International.

Eighth and final Lead Lecture was given by Dr (Ms.) A. Sinha, Principal Scientist, ICAR-CIFRI, Barrackpore on 'Bioremediation of aquatic plants: application of multi-omic approaches'. She spoke about aquatic toxicants and metabolites; salient features of different kinds of bioremediation techniques (rapidly growing area of environmental

biotechnology) towards aquaculture enhancement and improving fish health, viz., biofilm/periphyton based bioremediation, biostimulation, bioaugmentation (green water technology), biofloc system (uptake of nitrogenous compounds generating microbial protein thereby decreasing feed cost), biodegradation, nano-remediation. Fate of aquatic contaminants depend largely on various metabolic activities of microorganisms present in aquaculture ecosystem. According to Dr Sinha, utilization of microorganisms to clean up these contaminants from polluted environment is a

potential solution to such environmental problems. Microbial bioremediation is advantageous resulting in formation of completely non-toxic end products. Current bioremediation strategies are useful in minimizing consumption of water for aquaculture and its release, recycling organic matter, reduced pathogen introduction, enhanced ecosystem productivity.

News communicator Subrato Ghosh listened to all the nine informative Lectures in this Satellite Symposium attentively and gained knowledge. It was followed by Poster Presentations by research scholars. In the

Valedictory Session of this International Conference, Sri N. C. Pramanik, Chief Organizing Secretary; Dr K. Ghosh, Organizing Secretary; Dr A. R. Ghosh, Professor of Environmental Science, Burdwan University and Convener; Dr (Ms.) K. Das, University of Liege, Belgium and Guest-of-Honour and Dr B. K. Mahapatra, Joint Organizing Secretary spoke briefly and expressed their viewpoints. Best paper presenters in different technical sessions of this 3-day International Conference were awarded with Medal and Certificate. It was a very successful and useful event.

## Pursuit of profits by big supermarkets pushing shrimp farmers into exploitation, research reveal

Pursuit of windfall profits by big Western supermarkets on the back of low wholesale prices is causing widespread labour exploitation in the shrimp aquaculture industries of Vietnam, Indonesia, and India, a new investigation published by AP, has found.

The investigation conducted by an alliance of non-governmental organisations (NGOs) and the findings provided to the publication, focussed on the three countries which are among the largest producers of shrimp.

The analysis reveals that producers supplying shrimp to top global markets the United States,



the European Union, the United Kingdom, and Japan have seen earnings drop by as much as 60% from pre-pandemic levels.

The drive to meet

supermarket pricing demands has forced producers to cut costs, primarily through labor, resulting in unpaid overtime, wage insecurity, and work that does not

meet minimum wage standards.

### Report paints a stark picture of shrimp workers

Over 500 interviews were conducted with shrimp workers, supplemented by data from secondary sources, to paint a stark picture of the realities faced by laborers in these countries.

In Vietnam, the report highlights workers peeling and processing shrimp for six or seven days a week in freezing conditions to preserve product quality.

Women, who comprise about 80% of the workforce, are particularly affected. Many of them work long hours rising as early as 4 am and returning home after 6 pm.

Pregnant women and new mothers are permitted to stop one hour earlier, but conditions remain gruelling.



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In India, shrimp workers face even more hazardous conditions.

Researchers from the Corporate Accountability Lab found that the use of highly salinated water, combined with chemicals and toxic algae from hatcheries, contaminates the surrounding environment.

Child labor was also uncovered in some areas, with girls as young as 14 recruited for peeling shrimp.

Unpaid labor is widespread, and many workers are paid below minimum wage, face wage deductions, and work overtime without compensation.

Indonesia presents a similar situation, with wages that have fallen sharply since the Covid-19 pandemic.

Shrimp workers, who typically earn \$160 per month—below the country's minimum wage in most regions—are often required to work 12-hour days just to meet basic production targets.

### How did supermarkets respond to the investigation?

Some of the world's largest supermarket chains have been linked to the facilities highlighted in the report, including US retail giants Target, Walmart, and Costco, as well as Sainsbury's, Tesco, Aldi, and Co-op in Europe.

While Switzerland's Co-op stated that it maintains a "zero tolerance" policy for labor violations, claiming its producers are paid fair prices, other supermarkets issued more guarded responses.

Germany's Aldi pointed to independent certification schemes used to ensure responsible sourcing of farmed shrimp, but it did not specifically address pricing practices.

Sainsbury's deferred to the British Retail Consortium, an industry group, which reaffirmed its members' commitment to fair pricing and ethical sourcing.

The consortium noted that the welfare of workers in global supply chains is central to purchasing practices.

The Vietnam Association of Seafood Exporters and Producers, however, strongly contested the findings, calling them "unfounded and misleading."

It emphasized that government policies are in place to protect workers and ensure ethical practices.

### Shrimp certification and the hidden labor exploitation model

A critical finding of the report was the role middlemen play in obscuring the source of shrimp, allowing Western supermarkets to maintain ethical commitments without necessarily adhering to them.

According to the report, only about 1,000 of the 2 million shrimp farms in Vietnam, Indonesia, and India are certified by recognized standards such as the Aquaculture Stewardship Council or Best Aquaculture Practices ecolabel.

Given this disparity, it is impossible for certified farms to supply enough shrimp to meet

the demand of all the supermarkets claiming to purchase only ethically sourced shrimp.

This gap in certification allows labor exploitation to persist in many parts of the industry.

### Can policy changes help improve labor conditions?

According to Katrin Nakamura, who authored the regional report for Sustainability Incubator, Western governments could take more aggressive steps to hold retailers accountable.

Rather than imposing tariffs on suppliers, existing antitrust laws could be used to ensure fair pricing that does not place undue pressure on producers.

She argues that such changes could protect workers while still allowing for competitive pricing for consumers.

In July 2024, the European Union adopted a directive requiring companies to address human rights and environmental issues in their supply chains.

Furthermore, officials from Indonesia and Vietnam have engaged with the report's authors to explore potential solutions.

The report concludes by noting that the labor exploitation in the shrimp industry is not confined to specific companies or countries.

Courtesy: tradingview.com

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# Govt's power policy, no subsidy: Why area under shrimp farming is decreasing in Punjab?

*Farmers want to diversify crops for profits but no incentive for aquaculture pushing them to the brink*

Jalandar: Saroop Singh Sandhu, 40, started shrimp farming in 2017 on 2.5 acres of his total 15-acre land in Ratta Tibba village in Muktsar Sahib. He had tried fish farming in 2012 but was unsuccessful. Shrimp farming, however, proved more lucrative, bringing in profits of Rs 1.5 to Rs 2 lakh per acre. Encouraged, he Saroop expanded his shrimp farm to 35 acres. All was going well till 2021 but in 2022, the government changed its power policy for shrimp farmers and started charging Rs 7 per unit. He has now reduced his shrimp farming to just 15 acres.

Gurpayar Singh, 37, a marginal farmer from Bhangala village in Fazilka, met a similar fate. Hoping to profit from his otherwise unproductive saline land, he started shrimp farming on two acres a few years ago but faced around Rs 9 lakh loses when the shrimps died due to disconnection of power supply to the ponds. "I have now taken 5 acres on lease to grow cotton and to make ends meet," he said, adding that shrimp farming was a lucrative venture for marginal farmers like him but he could not continue due to government's policy.

Rupinderpal Singh Dhillon (35) of Jandwala Chrat Singh village in Muktsar Sahib also scaled down his

shrimp farming from 35 acres to 25 acres. He had started the farming on 1.5 acres in 2017.

These farmers and many more like them had hoped to revitalise their unproductive lands with this alternative farming practice. But are now being forced to either bring down operations or abandon the business altogether. They said shrimp farming is a promising venture for Punjab's farmers who are dealing with high amount of saline water in their farm lands but high electricity bills and hefty fines are forcing them to reduce area now.

Saroop Singh, who is also the president of Shrimp Farmer Association Punjab, said that in 2017, when shrimp farming started in the state, farmers had started increasing the area under the crop manifold. Till last year the area under it was 1200 acres but now it has reduced to nearly half.

"Earlier our power connections were treated under Agricultural Pump (AP) policy of the government under which all farmers of the state are covered and were getting free power for agriculture. But from 2022, our connections are treated under the industrial tariff category and we are charged Rs 7 per unit, which is very high

compared to states such as Andhra Pradesh, where such farmers pay at the rate of Rs 1.50 per unit," Saroop said, adding that farmers who grow paddy get power subsidy but others who are diversifying are getting hefty bills.

"The government can either include us under the AP category or can make some other viable arrangement so that this burden on farmers can be mitigated to a large extent. We pay around Rs 70,000 to Rs 1 lakh per acre power bill in a season apart from heavy fines," Saroop said, adding that profits have now reduced to Rs 50,000 per acre or nothing against Rs 1.5 to Rs 2 lakh earlier.

Gurpayar Singh said that he was fined Rs 9 lakh, and his electricity connection was cut off, causing his shrimps, worth around Rs 8 lakh, to die in the pond last year.

"The total electricity cost for shrimp farming in Punjab is around Rs 4.5 crore, which is a small fraction of the over Rs 20,000 crore power subsidy provided to agriculture (over Rs 9,000 crore) and domestic consumers. Additionally, shrimp farming helps with crop diversification, as it takes place alongside paddy farming and we are just demanding to rationalise this high rate of power being charged from us

as this farming is highly beneficial for small and marginal farmers who cannot pay such hefty bills," said Rupinderpal.

Rupinderpal also invested Rs 2.5 crore for setting up a cold storage facility for shrimp to preserve the stock during emergencies, receiving a central government subsidy of Rs 72 lakh. However, the Punjab government imposed a condition requiring him to operate the facility for three years before the subsidy could be released, a requirement that wasn't stipulated by the Centre.

Currently, farmers spend around Rs 10 lakh to start shrimp farming, and every year they need to spend Rs 6-7 lakh per acre. This includes about Rs 1 lakh for seeds, which are transported from Andhra Pradesh, Rs 3.5 lakh on feed, Rs 70,000 to 80,000 on medicine, Rs 1 lakh on electricity bills, and additional expenses for cleaning the ponds and other operational costs. In the first year, they incur extra one-time expenses, such as digging the pond up to five feet deep and installing aerators to supply oxygen to the shrimp at night. Seeds are introduced into the ponds between April and June, and are procured between July to October after completion of four months. After that ponds are dried and cleaned for the next season. Farmers said that shrimp from Punjab is considered among the best by traders from Andhra Pradesh.

Currently, shrimp farming or aquaculture takes place in four northern Indian



states Haryana, Punjab, Rajasthan, and Uttar Pradesh in 2,167 hectares (around 5,353 acres) of saline water and 8,554.15 metric tonne of shrimps are produced annually. A total area of 58,000 hectares in these four states is suitable for brackish water aquaculture. According to Centre Institute of Fishery Education (CIFE), Rohtak, in 2022-2023, aquaculture farming expanded to 2,942 acres in Haryana, 1,200 acres in Punjab, 1,000 acres in Rajasthan, and 20-25 acres in Uttar Pradesh.

In Punjab, the farming is done in Muktsar Sahib, Mansa, Bathinda, Faridkot, and Fazilka districts and in Haryana it is carried out in Sirsa and Rohtak districts.

“If the government supports us, shrimp farming could provide employment to thousands of people. Right now, we’re struggling just to survive,” said Rupinderpal, adding that despite the high demand for shrimp in international markets, including the US, Canada, and Australia, Punjab shrimp farmers are being pushed to the brink because of government policies.

Director and Warden of Fisheries, Punjab, Jasvir Singh said that they have prepared a proposal based on the demands of Punjab shrimp farmers and submitted it to the government. “It is currently under consideration. Shrimp farming is a lucrative business, and the state is committed to protecting and expanding it to help the farmers,” he said, according to a report in indianexpress.com.

## Union Minister Rajiv Ranjan Singh releases the "Amrit Catla" at ICAR-CIFA, Bhubaneswar

**Delhi:** Union Minister for Fisheries, Animal Husbandry and Dairying and Panchayati Raj, Shri Rajiv Ranjan Singh Alias Lalan Singh, today launched "Amrit Catla," a genetically improved variety of Catla (Labeo catla), at the ICAR-Central Institute of Freshwater Aquaculture (ICAR-CIFA), Bhubaneswar.. The National Freshwater Fish Brood Bank (NFFBB) of the National Fisheries Development Board (NFDB) received the Amrit Catla, ensuring its wider distribution and availability for farmers across the country. This development represents a significant milestone in freshwater aquaculture and aligns with the institute's efforts to enhance fish seed quality for India's growing fish farming community.

ICAR-CIFA began a selective breeding program in 2010 to improve the body weight of Catla at harvest, addressing the need for high-quality fish seed. The program collected nine strains of Catla, sourced from West Bengal, Bihar, Odisha, Andhra Pradesh, and Uttar Pradesh. These strains were utilized as the base population for the selective breeding program. Through the Combined Family Selection method, the breeding process was guided by phenotypic information and microsatellite markers. Superior animals were



selected based on breeding value, and after four generations of breeding, a 15% genetic gain per generation was achieved, leading to a cumulative gain of 35% by the third generation. Field trials conducted in Odisha, West Bengal, Assam, and Maharashtra demonstrated the improved Catla's ability to reach an average weight of 1.8 kg in polyculture systems, compared to 1.2 kg for local strains in one year. Recently, the "Amrit Catla" project received national recognition with the Best Technology Award at the 96th ICAR Foundation and Technology Day on July 16, 2024, and was officially trademarked as "CIFA-Amrit Catla" on August 1, 2024.

In his address, Shri Rajiv Ranjan Singh emphasized the Ministry's commitment to scaling up research initiatives. He assured that the Ministry would provide

substantial support for research endeavours in the fisheries sector to ensure sustainable growth and enhanced productivity. He also highlighted that the Ministry has recently declared ICAR-CIFA as the Nucleus Breeding Center for freshwater fishes, further solidifying its role in the development of high-quality fish seed in India.

The event was attended by Shri George Kurian, Minister of State for Fisheries, Animal Husbandry and Dairying and Minority Affairs, along with senior officials and stakeholders from the fisheries sector. The release of "Amrit Catla" underscores the government's dedication to advancing aquaculture practices, ensuring quality fish seed supply, and boosting the nation's fish farming industry.

*Courtesy: pib.gov.in*

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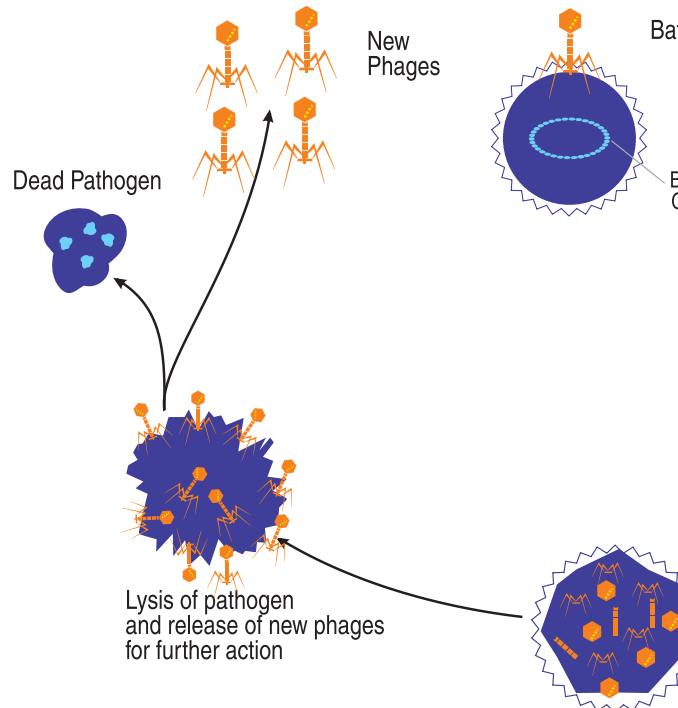
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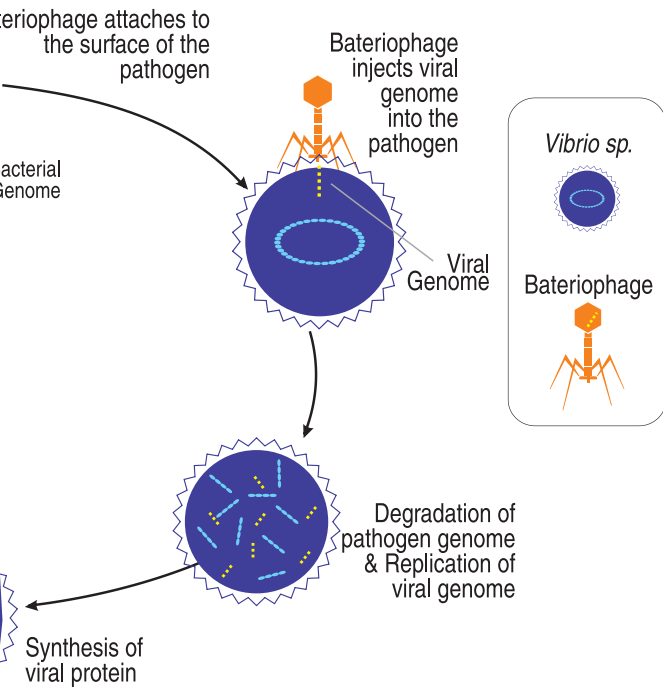
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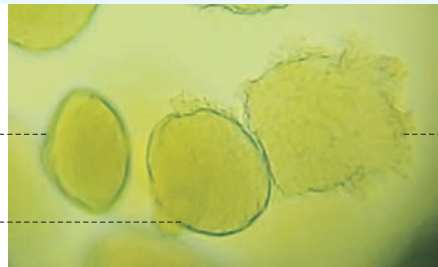
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**Colony 1 in Stage 1:**  
Intact Colony may be infected or yet to get infected.

**Colony 2 in Stage 2:**  
Phage infected Colony showing Partial lysis.



**Colony 3 in Stage 3:**  
Phage infected Colony Completely lysed, cell contents with multiplied phages spreads out in search of their host.

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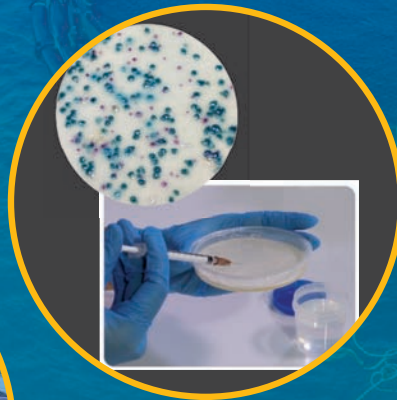


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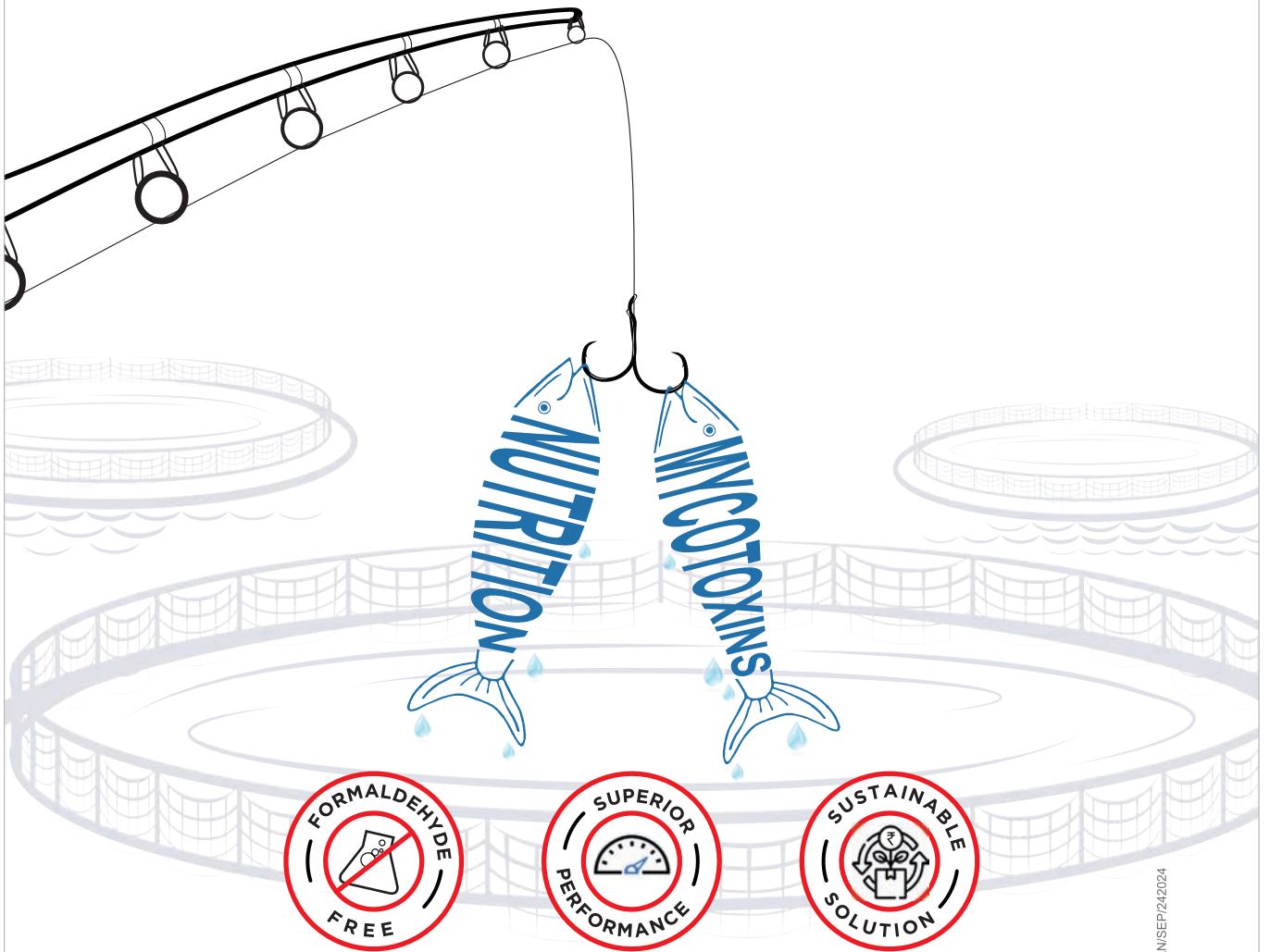
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# Deepak Nexgen aims at 400,000 tons Fish and Shrimp feed sale in 2024 – 2025

*Deepak Nexgen Feeds Pvt Ltd targets to achieve 20% market share in the 12 lakh tons Indian Shrimp feed market. The company claims No.1 position in fish feed sale in India with 20% market share of 10 lakh tons Fish feed market. Deepak Nexgen has 560,000 tons fish and shrimp feed production capacity. Also targets to achieve Rs 2600 crore turnover in 2024 – 2025, said A.V.Subramanyam, Managing Director, Deepak Nexgen Group in an exclusive interview by M.A. Nazeer, Editor, Aqua International.*



**A.V.Subramanyam,**  
Managing Director, Deepak Nexgen Group

**Vijayawada:** Deepak Nexgen Feeds Pvt Ltd has achieved a sale of 360,000 tons of fish and shrimp feed in the financial year 2023 – 2024 and has targeted to achieve 400,000 tons both Fish as well as Shrimp feed in 2024 – 2025, said Mr A.V Subramanyam, Managing Director of the company. In it, while Shrimp feed sale will be 220,000 metric tons, the sale of fish feed would be 180,000 tons, he stated.

Deepak Nexgen Feeds was established in 2012 with the production of 60,000 tons of Kingfish feed and went upto 180,000 tons by 2017.

In 2024, its production capacity was expanded to 260,000. The company's head quarters in Vijayawada, Andhra Pradesh.

Deepak Nexgen launched *ifeed* shrimp feed in 2017 with 75,000

tons production with two lines, and in 2021 expanded Shrimp feed production capacity to 300,000 tons. In 2021 itself, it has eight lines with a production capacity of 300,000 tons Shrimp feed production, Mr Subramanyam stated.

**Deepak Nexgen has 560,000 tons fish and shrimp feed production capacity**  
According to him, Deepak Nexgen presently has a production capacity of 560,000 tons of fish and shrimp feed.

Answering to a question by Aqua International, Mr A.V. Subramanyam stated that India's Shrimp feed market size is 12 Lakh tons and Deepak Nexgen has targeted to achieve 20 percent market share from the existing 18% share. Fish feed market size in India is 10 lakh tons and Deepak Nexgen has 20% market share and we are in No. 1 position in fish feed sale in India, Mr Subramanyam announced. In shrimp feed sale, we

are No. 2 with 2.20 lakh tons, he told.

## **Rs 2600 crore Turnover**

Mr Subramanyam informed that Deepak Nexgen will reach to annual business turnover of Rs 2600 crore in 2024 – 2025 with Rs 2200 crore from feed sale, Rs 350 crore from processing division and Rs 30 crore from medicines and nutrition products division.

We achieved fast growth for Deepak Nexgen Feeds. There are 36 companies manufacturing feed in aquaculture in India. No company got even 10,000 tons feed sale in the first year of launch and operations, whereas Deepak Nexgen achieved 40,000 tons feed sale in the first launching year. Our feed acceptance and performance-wise we are No. 1 in India, said Mr Subramanyam, adding that in the third year of operations Deepak Nexgen got 100,000 tons fish feed sale.



**Future Expansion:**

Our processing plant capacity will be expanded with 100 tons per day and will have Rs 1000 crore turnover from processing division alone, Mr Subramanyam announced with confidence.

The Company is going for Solar Energy soon for all its group companies and it will be pollution free and reduces financials. Our aim is to make Deepak Nexgen group green based industry by 2027 phase wise, he informed. We are going to invest Rs 200 crore for Solar project in our company, he informed.

Deepak Nexgen has 150 dealers for Shrimp feed and 200 Fish feed dealers all over the country and they are supported by 200 sales and technical team.

**Fish & Shrimp Feed Plant at Chattisgarh:**

In 2027, Mr Subramanyam informed that they want to setup fish and shrimp feed plant in Chattisgarh state to meet the requirement of Northern Region of the country.



We purchase premium quality high protein raw material like Soya and Fish meal directly from the producers. We, the directors of Deepak Nexgen will personally meet the producers, we do not have purchase department and we do not have any middlemen in between for raw material purchase. The company is 12 years old and we purchase raw material directly from the producers even today, stated Mr Subramanyam.

**What is your company's strategy to gain farmers confidence and for the growth of business ?**

Quality feed, service, making the feed available all the time, freshness of the feed and fast delivery with our own 70 trucks for feed delivery is our strength and our strategy along with well spread distribution network, highly engaged employees

in production, sales and technical services, and supervised by world class leadership, said the soft spoken and firm decision making Managing Director, Mr A.V. Subramanyam.

Replying to another question, he said, we never use Antibiotics as it has no value. We do not get any advantage by using antibiotics in feed, hence we do not use it.

**Farmers should bring good name to Indian shrimp**

As Shrimp raw material is exported to international markets, our thinking and working should be at international level. Keeping this in mind, farmers should produce quality shrimps. Farmers should work to bring good name to Indian Shrimps, said Subramanyam.

**Govt should develop domestic market for shrimp consumption in India**

Taking the support of private sector, the government should develop domestic market for shrimp consumption in India, he stated.



**FARM RECORD**

Aerial View of Deepak Nexgen Feeds Pvt Ltd - Feed Factories Unit 1, 2 & 3 at Koyyur Road, Bommuluru Village, Krishna District, A.P.





There is also a need of eliminating sub-standard products and inputs from the industry. Farmers should get awareness in this aspect in order to get better productivity and results, Mr Subramanyam opined.

#### Deepak Nexgen donates Rs 1 crore to A.P. CM Relief fund

Deepak Nexgen Feeds Pvt Ltd has donated Rs 1 crore to Andhra Pradesh Chief Minister Relief Fund for Flood Victims on 7 September 2024. During Covid time the company donated Rs 1.5 crore.

#### Key Persons of Deepak Nexgen

1. A.V. Subramanyam, Managing Director.
2. Movva Malleswararao, Director, Technical.
3. A.V. Seshadri, Chief Operating Officer (COO) – ifeed.
4. T. Srinivas, Chief Marketing Officer



India's #1 Floating Fish Feed Brand

(CMO), Kingfish Feed.

5. A. Chaitanya Vasu, Director, Plant Operations.

#### Deepak Nexgen Group Activities

1. Shrimp & Fish Feed Production.
2. Shrimp Processing Plant 50 MT / day and 10,000 tons annual processing capacity.
3. Medicines & Feed Additives through Deepak Nexgen Biotech Pvt Ltd.
4. Shrimp & Fish farming in 400 hectares in West Godavari and Krishna Districts in Andhra Pradesh.
5. Shrimp Hatchery.

We see Nexgen as a market leader that constantly innovates to provide best-value products and services to its thousands of customers.

To achieve world-class standards, Nexgen shall adhere to long-held corporate values of hard work, focus and integrity. To meet the ever-changing needs of customers, Nexgen shall take the lead in

*“Quality feed, service, making the feed available all the time, freshness of the feed and fast delivery with our own 70 trucks for feed delivery is our strength and our strategy along with well spread distribution network, highly engaged employees in production, sales and technical services, and supervised by world class leadership”*

**A.V. Subramanyam,**  
 Managing Director,  
 Deepak Nexgen Group.

constantly innovating its products and services. To become an employer of choice, Nexgen shall develop its employees into professionals who are highly motivated to excel in their respective fields of service, said Mr Subramanyam

The Company has action plans to have more R&D and innovation centers. They are also working to provide rural empowerment through CSR activities.



All Directors, from Left: Kushal Kondreddi, K. Pradhan Rao, Seshu Akkina, Srinivas Tetali, Chaitanya Vasu, Dr Movva Malleswararao, Director Technical, K. Ravindra Rao, P.V. Ramana K.V. Satyanarayana, Balamurali and K. Apparao. Sitting at centre: A.V Subramanyam.





**A.V. Subramanyam, Managing Director**

A.V. Subramanyam has been exposed to diverse businesses before founding Nexgen. His expertise and vision made him the most successful feed manufacturer in India in a short span of time. Being the Managing Director of Nexgen, he takes utmost care of raw material procurement, Financial management and overall monitoring of day to day activities. His direction and leadership made Nexgen the 2nd largest aquaculture feed manufacturing company in India.



**Dr. Movva Malleswararao, Director, Technical**

Dr. Movva has been associated with aqua industry for the last 30 years. Being a Ph.D. holder in Aquaculture, his contribution to Nexgen is highly remarkable. He manages the R & D division, formulating the shrimp and fish feeds for optimal results, and is responsible for the feed's quality and assurance.



**Seshu Akkina, Chief Operating Officer**

Seshu Akkina has been exposed to numerous renowned multinational companies. His able leadership and experience in aquaculture marketing made Ifeed as the power brand and positioned it among the top 3 largest shrimp feed brands in India in just 5 years. He is leading Ifeed (shrimp feed) and health-care's marketing divisions.



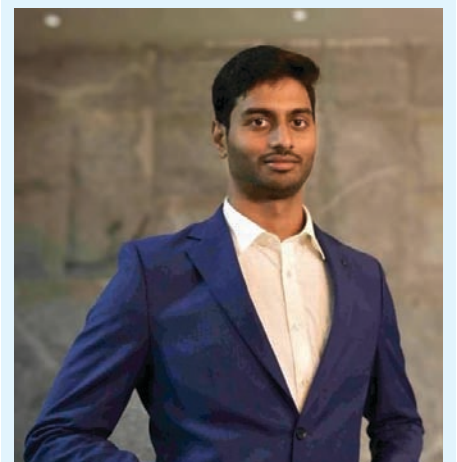
**Srinivas Tetali, Chief Marketing Officer**

Srinivas Tetali has 32 years of experience in aquaculture. His association with reputed companies has made him highly successful in the floating feed market segment. His commitment and passion in marketing Kingfish, made it India's No.1 fish feed brand.



**Chaitanya Vasu, Director, Plant Operations**

Chaitanya Vasu, who has done his MBA in International Business Management from Leeds University, UK, is taking care of feed plant operations and production. His dedication and hard work in producing quality feed has made Nexgen the most trusted company. His constant focus on cleanliness and timely maintenance of the plant is responsible for the finest delivery of feed.



**Kushal Kondreddi, Director, Frozen Foods Division**

Kushal Kondreddi, a Master's graduate in Engineering and Management from New Jersey Institute of Technology, is currently leading the Nexgen Frozen Foods division. With experience across various prestigious companies in the U.S., Kushal brings valuable global expertise to Nexgen, helping steer the company towards continuous growth and innovation.



Performance Par Excellence

## GOLDEN MARINE BIOTECHNOLOGIES PRIVATE LIMITED

### ▶ Our Innovation

Bdellovibrio bacteriovorus – A game Changer for aquaculture health care.

B. bacteriovorus is an obligate predatory bacterium that selectively prey, invade and consume broad range of gram-negative bacteria including all the Vibrio species.

### ▶ The Problem

Vibriosis caused by Vibrio species, poses a significant threat to global aquaculture industry. These gramnegative bacteria lead to devastating losses in hatcheries, grow out farms and breeding facilities

We are thrilled to share our most recent breakthrough - a patented and groundbreaking solution designed to combat Vibriosis and other gram-negative bacterial challenges in the global aquaculture industry.

# FINADELLA

### ▶ The Solution

Our R&D team has extensively worked to create an innovative solution that tackles Vibriosis head-on. Leveraging cutting-edge science, we have developed a proprietary formula that:

- Target Gram-Negative pathogens: Our solution specifically addresses gramnegative pathogens, minimizing their impact on aquatic health
- Boosts Immunity: By enhancing the immune response of aquatic organisms, we empower them to fight off infections more effectively
- Ensures Safety: Rigorous testing and validation have confirmed the safety and efficacy of our product



## Comparison

### ▶ Bacteriophage

- Each phage has a narrow host range and are highly species specific. It targets specific bacterial species or strains
- Thrive only when their specific prey bacteria are abundant
- Bacteria can develop genetic resistance against bacteriophage

### ▶ Bdellovibrio

- Bdellovibrio is like a versatile hunter. Typically, Bdellovibrio targets gramnegative bacteria
- Can adapt and survive under specific conditions like, nutrient / prey limitation
- Bacteria cannot develop genetic resistance against Bdellovibrio
- Could be useful for bioremediation removing mixed bacterial communities



## PATH BREAKING INNOVATION DEVELOPED FOR THE EFFECTIVE PATHOGEN CONTROL IN AQUACULTURE

To protect the aquatic animals from pathogen and increase the aquaculture production, after a long research GOLDEN MARINE BIOTECHNOLOGIES PRIVATE LIMITED, INDIA introduces FINADELLA, for the first time in aquaculture industry which works through the super power of Bdellovibrio bacteriovorus

## INNOVATIVE AQUACULTURE FEED PREMIX WITH PREDATORY MICROBES

B. bacteriovorus is a promising natural agent for controlling bacterial pathogens including antibiotic resistant strains. Among the pathogenic bacteria, species belonging to Vibrio are the most common and wide spread diseasecausing agents in aquaculture. Bdellovibrio can potentially help us to meet challenges as an effective future control agent in the fight against harmful pathogens like Vibrio in aquaculture



GOLDEN MARINE  
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PRIVATE LIMITED

# FINADELLA



Can avoid onset of vibriosis in Hatcheries  
Can avoid onset of vibriosis and other gram-negative bacterial diseases in nurseries and grow outs

Use of probiotics and Predator microbes of FINADELLA - the latest and safest concept in Aquaculture

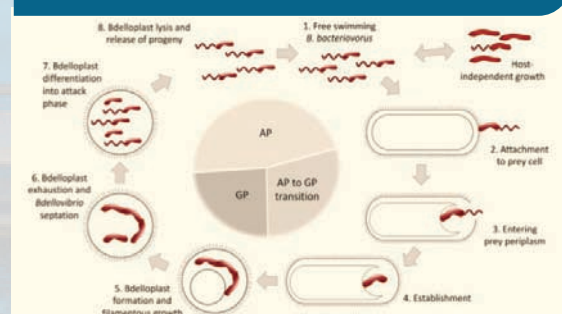
### Use of Antibiotic and Chemicals:

1. Kills helpful microbes along with harmful microbes
2. Traceability-consumer health & food safety
- Resistance- non sustainability to common antibiotics and chemicals

## Applications

- Can be used as a living antibiotic
- Can be applied as a potential probiotic and antibiotic agent
- Can control a variety of bacterial diseases in aquaculture
- This product selectively kills gram-negative pathogens and allows gram-positive bacteria like Bacillus Species to grow

## Mode of action of FINADELLA



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## Article of the Month

# Perils of Ammonia



Shrimps are a substantial contributor to global aquaculture exports. Aquaculture ponds' organic load has significantly increased due to poor feed management and inadequate water quality maintenance. They are further altering the water quality indicators, which include the concentration of heavy metals, organic matter, pH, temperature, dissolved oxygen, ammonia, nitrate, and nitrite.

Among these parameters, ammonia is crucial in polluting the aquaculture pond. Ammonia is toxic to shrimps even at low concentrations, causes mortality and huge loss to the farmers.

### INTRODUCTION:

Aquaculture is a fast-growing agricultural sector that helps ensure global food security and nutrition while providing significant economic benefits to farmers and the country. In 2023–24, frozen shrimp remained the most popular export in terms of quantity (716,004 MT) and value (40,013.54 crore).



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# Article of the Month

## AMMONIA:

Among the nitrogenous compounds, ammonia is highly toxic to shrimps, compared with nitrite and nitrate. Ammonia exists in two forms in water: ionized ammonia ( $\text{NH}_4^+$ ) and unionized ammonia ( $\text{NH}_3$ ). Unionized ammonia is more harmful to shrimps than ionized ammonia. Total ammonia nitrogen (TAN) is calculated by adding ionized and unionized ammonia. The ideal range for free ammonia should be less than 0.1 ppm, and total ammonia should be less than 1 ppm. The hazardous form of unionized ammonia grows with increasing pH and temperature in the pond.

## SOURCES OF AMMONIA:

### 1. Uneaten feed:

The uneaten or surplus feed sinks at the bottom and eventually decomposes, producing ammonia as an end product.

### 2. Shrimp excretion:

The shrimp generates nitrogenous waste in the form of ammonia by metabolizing the protein from feed.

### 3. Decomposition:

The dead animals, algae, and other organic stuff degrade and discharge ammonia into the pond.

### 4. Source water:

Sometimes fertilizers from the source water provide ammonia to the pond by decomposing nitrogen molecules.

### 5. Moulting:

Moulting is an essential process by which shrimps gain weight. During moulting, the shrimp shed their exoskeleton into the environment. Nitrogen waste in the form of ammonia and urea is the byproduct of moulting.

### 6. High stock density:

Due to high stocking density, also leads to high waste deposition in the pond, resulting in excessive ammonia.

## IMPACTS OF AMMONIA:

Ammonia is extremely hazardous to animals when it rises above its optimal range since it disrupts shrimps' regular processes, including



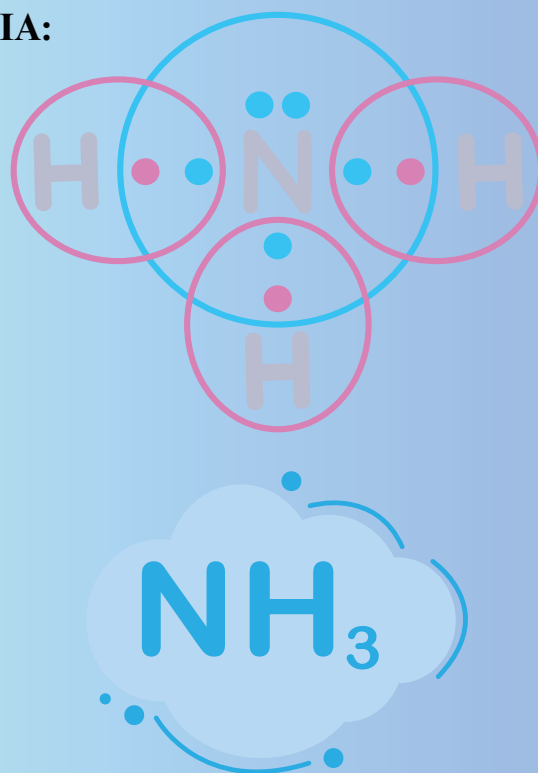
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## Article of the Month

### CONTROL MEASURES OF AMMONIA:

- Pond ammonia can be managed in several ways such as regular water changes, pond aeration, feed management, keeping the pH and acidity of the ponds maintained, use of probiotics and yucca etc.
- Several studies have shown that the use of yucca controls ammonia in ponds and is an environmentally beneficial bioremediation approach.
- Probiotics considerably lowers ammonia and other hazardous gases such as nitrite and nitrate, and it is another environmentally helpful technique to regulate it.



### “SAN YUPRO: THE SOLUTION YOU NEED”



There are several ways to monitor the ammonia levels in the ponds, and various methods to address the nitrogenous waste accumulation, removal, degradation and management. One of the effective ways of management and degradation is by the application of SAN YUPRO. SAN YUPRO is a combination of Yucca and Probiotics. Yucca binds to the ammonia making it unavailable to the pond ecosystem, whereas probiotics strains present in SAN YUPRO utilize ammonia, nitrite and nitrate as the nutrition for their multiplication. Therefore, probiotics and yucca complement each other rather than acting alone.

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Type	Single-screw	Twin-screw	Twin-screw	Twin-screw



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Moisture evenness  $\leq 1.5\%$   
Use only one-third power compared to other competitors.



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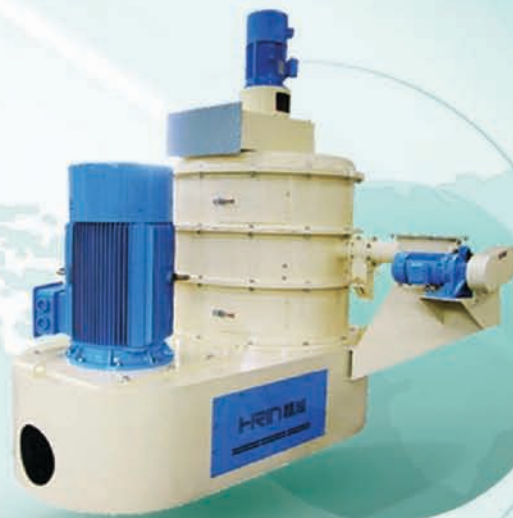


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## Hengrun SWFL Series Vertical Pulverizer

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%.



# Spotted Scat fish (*Scatophagus argus*): A potential species for brackish water aquaculture and aquarium trade

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Tamil Nadu Dr J. Jayalalithaa Fisheries University, Chennai

## Introduction

*Scatophagus argus* is a brackish water fish, that belongs to the family Scatophagidae under the order Perciformes. It is commonly known as “spotted scat” due to the presence of numerous black spots on its body. It is also known as leopard pomfret, butterfish, argus fish, spade fish, and spotted spade fish. In the ornamental fish markets of India, it is popularly known as “Indian discus.” It is a popular aquarium fish species around the world due to its colourful appearance, hardiness, slow growth, and calm behaviour. It is a euryhaline teleost fish, widely distributed in fresh, brackish, and marine waters of the Indo-Pacific. *S. argus* is an economically important aquaculture species in East and Southeast Asia due to its easy cultivation, low feeding cost, and high market price. It is also popular as a food fish with a low fat and high-protein content and is a popular aquarium species due to its colourful appearance and calm behaviour. It has a native range in the Indo-Pacific, the Malay Archipelago, Philippines, China, Australia, South and South East Asia especially in India and Sri Lanka.

## Physical Description

*S. argus* has a body which is quadrangular and strongly compressed with the head having a steep dorsal profile. It has a



*Scatophagus argus*

moderately large eye which has a diameter noticeably smaller than the length of the rounded, snout.

They have a small, horizontal mouth which is not protractile. There are a number of rows of small bristle-like teeth in the jaws. The dorsal fin has 10-11 spines and 16-18 soft rays, while the anal fin has 4 spines and 13-15 soft rays. The spines and rays of the dorsal fin are separated by a deep notch and the first spine in the dorsal fin lies flat. The rear margins of the soft parts of the dorsal and anal fins are roughly vertical. The caudal fin is rounded in juveniles and truncate to weakly emarginate adults. Small ctenoid scales cover the body. Spotted Scat fish are easily recognizable by their distinctive coloration and markings. The body is greenish-brown to silvery with many browns to red-brown spots. Juveniles are a greenish-brown with either a few large, dark, rounded blotches, or five or six dark, vertical

- ▶ *Scatophagus argus*, known as "spotted scat," is prized in both aquarium trade and culinary spheres across South and Southeast Asia.
- ▶ Inhabiting a diverse range of waters, from freshwater to estuarine environments, *S. argus* demonstrates adaptability and resilience.
- ▶ Challenges to its aquaculture include a slow growth rate, prompting research into growth enhancement methods and polyculture strategies.
- ▶ Despite ongoing efforts, commercial cultivation of *S. argus* remains limited, signalling the need for further advancements in the field.



bars. This species attains a maximum total length of 38 cm (15 in). In large adults, spots may be faint and restricted to the dorsal part of the flanks.

#### Natural Habitat and Diet

*S. argus* lives in freshwater, natural embayment's, brackish estuaries and the lower reaches of freshwater streams, often in mangrove areas. They are found in marine waters or estuaries of the Indo-Pacific region from the western coast of India to New Guinea and northern Australia and also along the coast of Africa. Occasionally they enter various freshwater habitats. Juveniles generally live in muddy coastal areas, including estuaries, mangroves, harbors, and the lower courses of rivers, whereas adults migrate to marine environments. *S. argus* can stand with various water bodies due to its strong ability of osmoregulation. *S. argus* is native to the following countries: Andaman Islands, Bahrain, Bangladesh, Cambodia, China and Taiwan, India, Indonesia, Iran, Iraq, Japan (including Ryukyu Islands), Kuwait, Malaysia, Myanmar, Oman, Pakistan, Philippines, Qatar, Saudi Arabia, Singapore, South Korea, Sri Lanka, Thailand, Timor-Leste, United Arab Emirates, Vietnam, Australia, Fiji, French Polynesia, Micronesia, New Caledonia, Palau, Papua New Guinea, Samoa, Tahiti, Tonga, and Vanuatu. Scat has a broad diet and eats detritus, filamentous algae, phytoplankton, aquatic macrophytes, zooplankton, benthic invertebrates and other macrozoobenthos. Adult scats are primarily herbivorous while the juveniles prefer zooplankton.

#### Reproduction

Sexes of *S. argus* can be distinguished by observing the head shape. In the females, the head profile ascends at a constant slope, but the males have a concave curvature in the head above the eyes. This difference is more prominent in the larger fish, but noticeable also in the fish as small as 100 gm. In addition, the females are often lighter, olive-green in colour compared to the darker males. Multiple spawning nature of *S. argus* have been reported. Spotted scat is used to spawn twice in a season; once during the southwest monsoon season (June to August) and the

other during the northeast monsoon season (October to December) in the Mandapam coastal region, Southeast coast of India. It has been reported that a total length of 12–12.9 cm and 14–14.9 cm as length at first maturity for male and female, respectively.

#### Importance in aquaculture and aquarium trade

In aquaculture, the Spotted Scat fish has shown great potential for commercial production. Its ability to thrive in brackishwater conditions make it an economically viable option for aquaculture operations. Usually, the natural habitat of *S. argus* is characterized by fluctuations in salinity, temperature, dissolved oxygen, tidal movements, river runoff, turbidity, and turbulence. It can also tolerate other conditions like high/low temperature, tidal motion and opacity. These characteristics make *S. argus*, a desirable native fish for aquariums. Adaptations to live in such ever changing environments endow scats with many biological attributes that are highly desired in cultured finfish. It has been reported that high temperature tolerance limits for *S. argus* adults. It has the ability to tolerate low dissolved oxygen concentrations even less than 2 mg/L and has a large pH tolerance range. Further, it has several excellent characteristics for culture such as a calm nature, favourable taste and appearance, and good market price. It also has the ability to take advantage of the most profitable food source available in the habitat at a particular time and to select necessary food items that maximize fitness and energy gain. It has been reported that scat is one of the few teleost species of economic importance that could potentially thrive in tropical brackish water fish ponds. *S. argus* is one of the potential candidate species for brackish water aquaculture and ornamental fish trade. With its unique appearance and adaptability to various environments, the Spotted Scat fish has garnered attention from aquaculturists and aquarium enthusiasts alike. It has characteristics such as colourful appearance, hardiness, calm behaviour, high protein content and good taste. This species has been reported to fetch good market price in inland markets and are in demand for ornamental

fish trade in India. So far, the culture of this species has not been taken up in India except for one experimental rearing of *S. argus* with *Etroplus suratensis* in West Bengal.

#### Challenges and Considerations

Despite recognizing the potential of cultivating scats in captivity, significant progress has yet to be made. The primary challenge in scat culture is their inherently slow growth rate. To address this, several studies have been conducted to enhance and standardize their growth in captivity. These studies have explored the use of growth-promoting substances and examined the effects of salinity and stocking density on scat growth. Additionally, researchers have investigated induced breeding using specific agents, as well as the potential for polyculture with tiger prawns (*Penaeus monodon*) and milkfish (*Chanos chanos*).

#### Summary

*S. argus*, also known as “spotted scat,” is a brackish water fish belonging to the Scatophagidae family, widely recognized for its popularity in both aquarium trade and culinary use, particularly in South and Southeast Asian countries. With its native habitat spanning the Indo-Pacific region, including areas like India and Sri Lanka, this species boasts a striking appearance characterized by its rectangular, compressed body adorned with brown spots. Inhabiting freshwater, inshore, and estuarine waters, often amidst mangroves, *S. argus* exhibits a diverse diet, ranging from detritus and algae to benthic invertebrates, with a preference for herbivory among adults. Its reproductive behaviour is marked by sexual dimorphism and multiple spawning seasons, typically occurring during the southwest and northeast monsoon periods in India. Despite its potential for aquaculture, the species faces challenges, notably its slow growth rate. Efforts were made to address this hurdle including research into growth-promoting substances, breeding techniques, and potential polyculture with other species like tiger prawns and milkfish. However, commercial cultivation of *S. argus* remains limited, with further progress needed to harness its full potential in the aquaculture industry.

# EXPERIMENTAL LEARNING PROGRAMME (ELP): An Approach towards Developing Skilled Professionals

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## ✓ INTRODUCTION

### WHAT IS ELP?

The Indian Council of Agricultural Research introduced the experiential learning programme (ELP) into the curriculum of under graduate programmes in fisheries, veterinary, agriculture, horticulture, and other allied fields as one of the components under the students READY (Rural Entrepreneurship Aware) initiative in response to the nation's constantly growing population and the community of unemployed people's growth with the limited quota of government jobs (both state and central). "To prepare students to become job providers rather than job seekers" was the slogan. Thus, the curriculum places a strong emphasis on the value of helping students adopt an entrepreneurial attitude. Typically, the ELP is held during the second to last semester of the undergraduate curriculum.

A programme called experiential learning is founded on the ideas of "Learning by doing" and "Seeing is believing."

### ✓ IMPORTANCE & BENEFITS OF ELP

- Increasing field knowledge and experience

- Providing solid, hands-on experience and practice with the challenges of intercultural differences for a significantly changed personal mindset and a new perception of their individual education programmes,
- It helps bridge the gap between a strictly academic setting and a real workplace environment,
- Students also learn how to discover for themselves; rather than relying on only provided material, they develop the investigative skills to find answers to questions, as well as various skills like negotiation, conflict resolution, communicative skills, networking, etc.
- Provides an environment for cooperation among students as well as a platform to take on leadership roles, make mistakes, and learn by reflecting on them.

### ✓ MAJOR SUCCESS IN ELP

The experiential learning provided to undergraduate students has a profound impact on their mindset by equipping them with skills and motivating them toward holistic development, focusing more on

specific dimensions to shape their career. Some examples of success stories in ELP include

#### DR YSR HORTICULTURAL UNIVERSITY - Andhra Pradesh

Skill Development & Entrepreneurship/Employment through

- Production of quality planting material for fruit crops.
- Preparation of various forms of value added products
- Poly-house cultivation and production of high-value crops such as tomato, capsicum, cucumber, hybrid tea rose, and so on that are sold in local market.

#### COLLEGE OF FISHERIES (CENTRAL AGRICULTURAL UNIVERSITY – IMPHAL) - Tripura

The students have increased their through knowledge on various fields as following

- Breeding of various fishes like Rohu, Catla, Pabda, Indian Cat fishes, etc.
- Selling of various fish products like fish momo, fish samosa, fish pickles, prawn pickles, etc.



- Hands-on experience with fish feed production as well as handling different components of a fish farm
- Interaction and selling of fish seed to farmers, etc.

**JAWAHAR LAL NEHRU KRISHI VISHWAVIDYALAYA, JABALPUR - Madhya Pradesh**

**Skill Development**

- Mass Production of Bio- Agents and Bio-pesticides.
- Commercial fruit and vegetable production.
- Tissue culture and micro propagation of medicinal plants.

**Products Developed**

- One step method for multiplication of entomopathogenic fungi viz., *Beauveria bassiana*, *Metarhizium anisopliae*, *Verticillium lecanii*, *Paecilomyces fumosoresu*.
- Production of high quality entomopathogenic fungi which is highly effective against lepidopteron pests of legumes and horticultural crops.

**MPUAT, UDAIPUR - Rajasthan**

**Skill development**

- Milk and value added milk products
- Renewable Energy sources

**Entrepreneurship/ Employment**

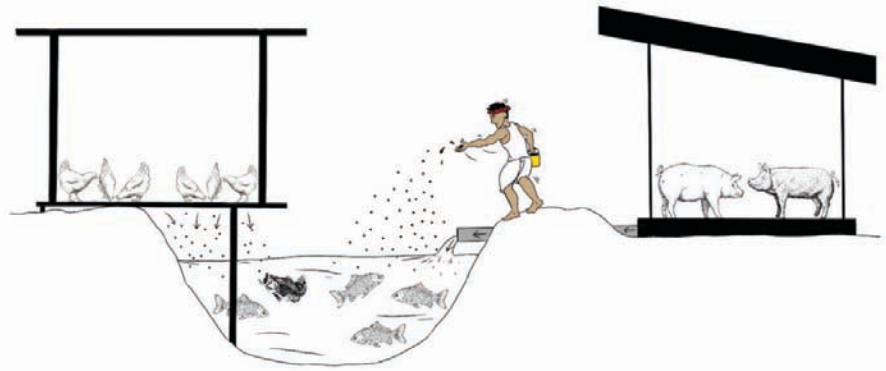
- Licensed to SARAS Dairy Udaipur for sale of products
- Placement as Senior Executives in MNC's such as Nestle, Cadbury, ITC, Dynamix India Pvt. Ltd., Tropilite foods etc.

**✓ CASE REPORT - ELP programme 2022 College of Fisheries (CAU-I) TRIPURA**

It is taken up during 8th semester of four (4) year degree program for the duration of five (5) months [March - July 2022] but owing to the effects of the 2 year outbreak of the pandemic COVID -19 ELP programme delayed & started in the last semester.

The experiential learning programme under the college was conducted by 3 departments viz

- Department of Aquaculture (16



*Fish Farming; Pond management is done for better production and benefit; divided into 3 practices*

students)

- Department of Fish Genetics and Reproduction (15 students)
- Department of Fish Processing Technology (8 students)

**❖ Department of Aquaculture (AQC)**

To maximize sustainable resource utilization and revenue generation, the Department of Aquaculture has selected the “Integrated Semi-Intensive Aqua Farming Model” as its primary model. The 5 components under the model / aquaculture department are: Fish Farming, Pabda Seed Production, Pig Rearing, Poultry Raising and Fish Feed Production.

**STOCKING;** There were 6 different species cultured during the ELP period viz: *Labeo rohita*, *Labeo catla*, *Cyprinus carpio*, *Labeo gonius*, *Puntius sarana*, *Cirrhinus mrigala*. More emphasis was given on carps due to their availability & demand from customers as well as ease in the growth process during the limited culture period.

**POST-STOCKING** management practices like dyke cleaning of marginal aquatic weeds, netting to remove cannibalistic & unwanted weed fish, liming in proper dose to avoid pH fluctuation. The



**PRE-STOCKING** MANAGEMENT; Dyke cleaning, Netting, Liming and Manuring are done to increase productivity per unit area of pond.

culture practice here was based on semi intensive model so natural productivity of the pond was given much importance too.

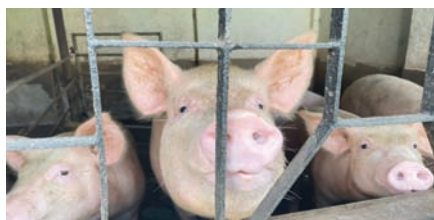




**Pabda Seed Production;** Breeding of pabda was done using Ovotide hormonal administration, taken care until it reaches the fry & fingerling stage then sold in oxygen filled bags to various farmers.



**Pig Rearing;** A total of 6 pigs were reared following management practices like cleaning the piggery house twice a day (morning and evening), Deworming, Castration, Proper feed management.



**Poultry Raising;** 450 nos. of chicks were reared in a period of 2-3 months each in a properly maintained chicken coop provided with proper air flow, feed & water as well as proper vaccinating of chicks at the right timing to prevent any form of disease that may occur.





**Fish Feed Production;** Floating pelleted feed are made and sold in properly packaged bags @ 38 Rs /kg by using major ingredients Maize/corn, Mustard oil cake, Dry fish, Broken wheat, Rice bran & Dana/Cattle Feed.

Total Revenue Generation by AQC Students

S. No.	Ingredients	Total Expenditure	Total Revenue Generated	Net Profit
1	Feed Production	Rs. 2,50,900	Rs. 3,48,750	Rs. 97,850
2	Fish Farming	Rs. 64,038	Rs. 1,19,344	Rs. 55,306
3	Pabda Seed Production	Rs. 7,400	Rs. 52,800	Rs. 45,400
4	Poultry	Rs. 81,042	Rs. 91,501	Rs. 10,455
5	Piggery	Rs. 40,980	Rs. 81,000	Rs. 40,020
	Total	Rs. 4,44,360	Rs. 6,93,395	Rs. 2,49,031

TOTAL REVENUE = **Rs. 6, 93,395**  
 TOTAL EXPENDITURE = **Rs. 4, 44,360**  
 TOTAL NET PROFIT = **Rs. 2, 49,031**  
 INSTITUTIONAL SHARE (25%) = **Rs. 62,257**  
 STUDENTS SHARE (75%) = **Rs. 1, 86,773**  
 PER STUDENT PROFIT **Rs. 14, 367**  
 (NET PROFIT/NO. OF STUDENTS)\*

\*3 students went for foreign training

❖ **Department of Fish Genetics and Reproduction (FGR)**

The Fish Genetics and Reproduction Department consists of breeding and seed production of carps, catfish, and freshwater prawns.

*Labeo rohita, Labeo catla, Barbonymus gonionotus, Osteobrama belangeri, Cirrhinius reba, Heteropneustes fossilis, Claarias batrachus, and Macrobracium rosenbergii* breeding practices were completed. A great deal of knowledge was gained about the culture method, hatchery management, and specific on-field experiences. Total 13 students joined FGR.

Total Revenue Generation by FGR Students

TOTAL REVENUE FROM CARP, CATFISH & PRAWN HATCHERY = **RS. 1, 63,220**  
 TOTAL EXPENDITURE = **RS. 28,000**  
 TOTAL NET PROFIT = **RS. 1, 35,220**  
 INSTITUTIONAL CHARGE (25%) = **RS. 33,805**  
 NET PROFIT (75%) = **RS.1, 01,405**  
 PER STUDENT PROFIT **Rs. 7 800**  
 (NET PROFIT/NO. OF STUDENTS)

❖ **Department of Fish Processing Technology (FPT)**

The Fish Processing Technology Department mainly deals with the production and sale of value-added food products like fish pickles, fish kurkure, fish momo, fish samosa, fish kimbbap, fish roll etc., as well as the operation and sale of these products and more in the FPT canteen stall provided by the college. The use of equipment & machinery in food processing fields was also taught & used. Total 8 students joined FPT.

TOTAL REVENUE = **Rs. 1, 16, 330**  
 TOTAL EXPENDITURE/  
 COST OF PRODUCTION = **Rs. 80,000**  
 TOTAL NET PROFIT = **Rs. 36,330**  
 INSTITUTIONAL SHARE (25%) = **Rs. 9, 082**  
 STUDENTS SHARE (75%) = **Rs. 27,248**  
 PER STUDENT PROFIT **Rs. 3, 406**  
 (NET PROFIT/NO. OF STUDENTS)

✓ **OVERALL ECONOMICS**

Department	AQC	FGR	FPT
Total Revenue	Rs. 6,93,395	Rs. 1,63,220	Rs.1,16,330
Total Profit	Rs 1,86,774	Rs. 135,220	Rs.36,330
Total Expenditure	Rs. 4,44,360	Rs. 28,000	Rs.80,000
Institutional Charge (25%)	Rs. 62,257	Rs. 33,805	Rs.9,082
Net Profit (75%)	Rs. 2,49,031	Rs.1,01,405	Rs.27,248
SHARE PER STUDENT	Rs 14,367	Rs. 7,801.15	Rs.3,406

Total profit by all the departments = **Rs 3, 58, 324**

**What Students Enjoyed The Most?**

Liberty, Staff support, Flexibility, Team spirit, Practical implications, No authority anxiety and Adaptability

✓ **CONCLUSION**

The programme is a huge success in terms of providing actual skill development, practical experience, and on-field training to all of the students who are enrolled in it with handsome revenue generation. As a result, students, the nation's young, and the future's hope are given the required real-world skills to create their own jobs rather than relying on government quotas. As a result, it can narrow the wide disparity in unemployment throughout the nation.

# *Role of Binder Feed Gels as Growth and Health Agents for Profitable Aquaculture.*

**Dr Sujani Gudipati,**

*Head R & D, Advance Aqua Bio Technologies India Private Limited*

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[dr.vasu@aabtgroup.com](mailto:dr.vasu@aabtgroup.com)*

Good Aquaculture practices are the decision factors of a healthy and profitable aquaculture system. Good water, feed and disease management play a crucial role in the growth, survival and production. For this efficient management, an effective solution that balances the growth, health and production in terms of the nutrients with the perfect ingredient formulation, absorptions and assimilation is the essentiality for the success of aquaculture operations.

Binder Feed Gel, a special excellent gelatinous thick binding gel, binds the feed supplements, making it more attractable and palatable, with maximum feed intake, absorption and assimilation. Enhances the stability and durability of the feed, reduces the feed wastage while enhancing the growth and weight of the organism especially during stress condition and the loss of appetite which leads to protein and vitamin deficiency. Boosts up the protein synthesis and helps recoup fast.

The individual components of the

latest and one of the finest Feed Gel formulations for Aquaculture is made up of enzymes, amino acids and vitamins like Arginine, Phenylalanine, Tryptophan, Glycine, Inositol, Lysine, Methionine, vitamins B1, B2, B6, B12, A, C and D3, fortified with seaweed extract and fish attractants, that have unique and specific roles, with all its goodness being the specialty of the binder Feed Gel..

#### **ARGININE:**

Arginine, though not an essential amino acid becomes essential during times of stress. It improves intestinal competence. Stimulates muscle coordination Ureagenesis, immune function, antioxidant defense, somatotropic axis, stress responses and ammonia detoxification in fish. It is used for the biosynthesis of proteins, serves as the substrate to synthesize many biologically active metabolites, significantly increases insulin-like growth factor-I Arginine activates adenosine 5'-monophosphate (AMP)-activated protein kinase (AMPK) to help the body save and use the available

energy rather than synthesize lipid, activates the signaling pathway to promote protein synthesis and myogenesis. It exerts multiple immune-modulatory functions, including the regulation of both the innate and adaptive immune response.

#### **PHENYLALANINE:**

Phenylalanine, the essential amino acid basically stimulates the metabolic rate and is the key nutrient for the functioning of the immune system like activate and stimulate the proliferation of immune cells, thus improving biological immunity. It alleviates immunosuppression and is vital for the growth and development of the organism. It acts as an intestinal barrier protecting against infections.

#### **TRYPTOPHAN:**

Tryptophan an essential amino acid for normal growth, production and maintenance of the body's protein synthesis, muscles, enzymes and neurotransmitters for nerve health. It is linked to various behavioral patterns and reduced stress resulting



in positive effects on growth, feed efficiency and survival. It is also important as an anti-oxidant and immunity booster. Essential for energy metabolism and DNA production.

#### **GLYCINE:**

Glycine, though a non-essential amino acid, has crucial roles in various physiological activities, growth and health. It stimulates the immune system and activates the anti-oxidant activity in order to fight the free radicals that would otherwise cause oxidative stress, damaging cells, proteins and DNA. It contributes to the cellular growth and overall health.

#### **INOSITOL:**

Inositol though not a vitamin is considered as vitamin B<sub>8</sub> for its functionalities, like improved protein utilization and overall performance. It is an inclusion of the Phospholipid component of all membranes. Enhances feed efficiency, digestion and feed utilization, accelerates growth, improves lipid metabolism, bone and scale formation, improved pigmentation, enhanced disease resistance, maintains the gut micro flora, is an anti-stress agent, works from both inside and outside the animal.

#### **LYSINE:**

Lysine is the limiting amino acid, most important in protein synthesis, muscle formation, enzyme and hormone synthesis. Important energy source during starvation. Improves the ability to resist stress and impacts the immune system. Improves feed utilization, better FCR, by enhanced gastric secretions, improved disease resistance, promotes wound healing, shortens recovery time, improves carcass quality. Prevents defective connective tissue formation, enhances elasticity and collagen formation.

#### **METHIONINE:**

Methionine is an indispensable sulphur containing amino acid, must be obtained through diet only, possessing high nutritional value and very important for the physiological activities like growth, detoxification and immune function. Very important

for protein synthesis, bile salt production methyl production, prevents fatty liver, vital lipotropic, hepato protective, anti-stress and anti-oxidant agent preventing oxidative stress. Indispensable in disease prevention, growth, metabolism and proper development, influencing the entire wellbeing of the organism.

#### **VITAMIN B<sub>1</sub>:**

Vitamin B<sub>1</sub>, Thiamine is a co factor of life sustaining enzyme formation essential for cellular metabolism since its deficiency leads to loss of appetite, neurological disorders, immune suppression, lower viability and also death. It converts carbohydrates to energy, has a role in calcium homeostasis.

#### **VITAMIN B<sub>2</sub>:**

Vitamin B<sub>2</sub>, Riboflavin that the body uses to metabolize carbohydrates, fats and protein into glucose for energy. It is a catalyst in many physiological activities that are responsible for growth and tissue repair. Is an antioxidant and an immunostimulant for the proper functioning of the immune system. Due to Riboflavin deficiency, fats, carbohydrates and proteins cannot be digested to maintain the body, affects iron absorption, dysfunction of mitochondria and gastro intestine. Essential for normal development, enhanced growth, performance, feed utilization, nonspecific immunity and maintenance of intestinal morphology.

#### **VITAMIN B<sub>6</sub>:**

Vitamin B<sub>6</sub> Pyridoxine has an extensive range of physiological functions like the metabolism of proteins, lipids, and nucleic acids, regulation of immune responses, biosynthesis of different neurotransmitters and as an anti-stress agent.

#### **VITAMIN B<sub>12</sub>:**

Vitamin B<sub>12</sub>, Cyanocobalamin prevents anemia, helps in formation of the blood cells, very crucial role in growth and development. Required for the maintenance of nerve tissue, the synthesis of nucleic acid and in the lipid and protein metabolism.

#### **VITAMIN A:**

Vitamin A, the fat soluble vitamin acting as a steroid hormone is very important for growth, performance, immunity, oxidation resistance, structure and functioning of the organs. Plays a vital role in vision, erythropoiesis, enhances iron, glucose and lipid metabolism. Facilitates improved immune function during stress. Has effect on DNA repair, aids in the release of enzymes for protein metabolism. It has a role in protecting mucous membranes and developing bone tissue. A good anti-oxidant.

#### **VITAMIN C:**

Vitamin C plays a vital role in maintaining optimum growth and physiological functions of the body. It enhances immunity, strengthens and assures disease resistance, faster growth with higher survival rate, increases bio availability of calcium and other minerals. Elimination of muscular fatigue since it plays an important role in collagen synthesis an essential component of muscle. Improves overall health as an antioxidant, anti-inflammatory, increase resistance and stress response.

#### **VITAMIN D<sub>3</sub>:**

Vitamin D<sub>3</sub> a steroid hormone plays an indispensable role in the growth and health of the organism. It is very important for growth, performance, bone development, lipid metabolism, immune regulation and calcium homeostasis. It helps in the proper absorption of calcium and phosphorus in the development of the strong bones. Prevents bacterial infections, strengthens and regulates the immune system, a very good anti-oxidant.

#### **Seaweed extract:**

Improves growth, performance, health and resistance due to the novel sulphate polysaccharide that inhibit pathogen replication. Modulate the gut micro biota for better digestion and assimilation of the nutrients. Act as bio stimulants that stimulate the defense and growth of the organism by enhancing stress tolerance and nutrient uptake. Exhibit significant antimicrobial properties against

many infectious agents. As source of HUFA and PUFA along with proteins, vitamins, enzymes and minerals. As adsorbents to take up gases of the gut and facilitate better metabolism affecting the growth of the organism.

#### **Fish attractants:**

Fish attractants enhance the diet palatability and consequently, its acceptability this promotes quicker feed intake, minimizing the time that the feed remains in water and so preventing the deterioration of the water quality without affecting the growth.

A synergistic blend of these successful inclusions of the binder Feed Gel, whose working efficiency was tested by Advance Aqua Bio Technologies India Pvt. Ltd, show

that this binder Feed Gel formulation helps in the improvement of the vitamin efficiency of the feed by the additive effect. The addition of growth limiting amino acids enhance the growth while the vitamins are for healthy metabolism and improved protein metabolism for body building. The harmless binding agents maintain the feed stability. The other active ingredients prevent back leaching. This binder Feed Gel seems to enhance the feed quality, as nutrient supplement due to addition of Vitamins, enzymes helps in better reabsorption and assimilation. This binder Feed Gel formulation prevents feed loss as an effective feed binder, growth promoter and immunity booster. The enrichment of vitamins, aid in growth promotion, feed

attraction while the Enzymes help in better feed digestion & assimilation. The HUFA content of the inclusions make the fish or shrimp glossy with optimized molting.

This advanced excellent binder Feed Gel formulation is superior as a binding agent since it prevents feed wastage ensuring efficient feed consumption, for supplementation along with feed to achieve growth, higher feed efficiency, better FCR, to prevent stress and disease in Aquaculture, very effective even at lower inclusion leading to economic viability. Making binders especially Feed Gels good agents of growth and health, for a profitable aquaculture.

# *Extraction and Uses of bio-diesel from fish waste*

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## **Introduction**

The consumption of fossil fuel-based oils have been increasing in recent years, because of the increasing human population and rapid industrialization. The bio-diesel is used as an alternative source of petroleum-based fuel, because it is renewable biodegradable, non-toxic and can solve the energy related problems by mainly reducing the emission of gases which lead to global warming. The demand for fossil fuels in sectors such as heat and power generation is continuously threatening

global energy sustainability. The introductions of internal combustion engine and transportation sector are leading to the depletion of petroleum reserves at a faster rate. Moreover, the combustion of fossil fuels results in environmental pollution.

As the world is facing the challenge of solving the problem of fossil fuel shortage, biomass is the only promising source for renewable energy that addresses the issue of raising price for fossil fuel in the market.

An intensive research for alternative source for bio-diesel is started due to the shortage of petroleum production from organization of the petroleum Exporting Countries (OPEC). Bio-diesel will also replace petro-diesel; this minimizing the pollutants released from the combustion devices.

The most potential source for bio-diesel production can be vegetable oil, animal oil, waste oil, waste derived from plants and animals, also agricultural residues and municipal





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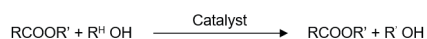
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waste. Recent studies have been carried out for the production of bio-diesel from vegetable oil, spent oil and Industrial oil. The physical properties and chemical properties of bio-diesel are similar to that of diesel, which enables that bio-diesel can be blended with petro-diesel oil and can be used for functioning of engines.

Fish waste is considered as one of the raw materials for the production of bio-diesel. Generally all parts of fish are not eaten, around 30 to 40% of parts are discarded as waste. The parts such as backbone, skin, head, tail and stomach are non-edible and considered as waste.

### Material and Methods used for the extraction of bio-diesel from fish waste

Biodiesel is produced through a process known as transesterification and represented by equation.



### Raw Materials

The fish processing waste have to be collected and fish fat has to be extracted. The chemicals sodium hydroxide and potassium hydroxide are used for the experiment. The purity and confirmation test for bio-diesel should be carried out. The properties of bio-diesel to be compared with ASTM standards.

### Extraction and Saponification

The fish fat can be extracted by heating the fish waste in three neck round bottom flask by using water as a solvent. It has to be heated in a heating mantle for approximately 80°C for one hour. Then it should be decanted for 30 minutes to separate the fat layer. The decantation of fat layer should be done once again for the complete separation process.

The extracted fat (10 ml) to be mixed and stirred in an electronic shaker with appropriate quantity of sodium hydroxide (25 ml) to undergo saponification reaction. Then the solution is subjected to centrifugation in a centrifuge at 3000 rpm for 15

- ▶ *Bio diesel is the most popular alternative fuel for petro-diesel.*
- ▶ *Biodiesel extracted from the fish waste reduces the discards of fish and the pollution. So fish waste is considered as the good raw material for the production of bio diesel.*
- ▶ *Bio diesel has the highest energy balance of any fuel.*
- ▶ *Bio diesel extends engine lifespan*
- ▶ *Using biodiesel as a vehicle fuel, improves air quality and the environment, increases energy security.*

minutes to separate saponified fat.

### Transesterification

Potassium hydroxide (0.9775g) is dissolved in a beaker containing 17.4 grams menthanol and has to be agitated continuously in a magnetic stirrer till the complete dissolution of potassium methoxide. The above formed potassium methoxide is mixed with 87.5 ml of fish fat and agitated for 1 hr. The mixture is then transferred to separating funnel. The content are allowed to settle down and the two distinct layer is formed, the top layer being bio-diesel and bottom layer being glycerol.

### Advantages

- Bio-diesel is a renewable source of energy
- Bio-diesel do not cause of any toxic effects
- Bio-diesel can be decomposed easily
- Bio-diesel can be used as an alternative fuel which solved the problem of environmental pollution and global energy deficit
- Bio-diesel has higher flash point
- Production cost of bio-diesel is cheaper when compared to petro-diesel

- The efficiency of bio-diesel is higher when compared to petro-diesel

Though the bio-diesel has many advantages, some disadvantages are also listed below

- Bio-diesel cannot be processed in lower temperature
- As the bio-diesel is prepared from the different raw materials, the difference in their quality is observed
- Bio-diesel will cause some issues in rubber tube of engines
- Lack of awareness among the people about bio-diesel

### Conclusion

The present article discusses the production of bio-diesel from the fish waste, their advantages and disadvantages. Bio-diesel is extracted by the processes of Saponification and Transesterification. Therefore, it can be concluded that production of bio-diesel from fish waste is showing a promising potential. Thus bio-diesel will contribute in the reduction of environmental impacts and acts as renewable energy to replace fossil diesel and petroleum products. So shifting to bio-diesel in future will save the environment and also fulfill the human needs.



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# The Economic Impact of Sustainable Fishing Practices: Balancing Conservation and Profit in Global Fisheries

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## Abstract

The oceans are essential for both the environment and global economies, with fisheries playing a critical role in food security and livelihoods. However, overfishing and habitat destruction have severely depleted fish stocks, threatening marine ecosystems and communities dependent on fisheries. Sustainable fishing, which balances conservation with economic gain, is essential for long-term viability. Key strategies include setting catch limits, reducing bycatch, imposing fishing bans and protecting habitats as it will help replenish fish populations and promote biodiversity. Economic benefits of sustainable fisheries include stable fish stocks, increased market access, job creation, and enhanced profitability. With rising consumer demand for sustainable seafood, adopting sustainable practices is not only environmentally necessary but also economically advantageous.

## Introduction

The world's oceans are a vital resource, not only for the environment but also for global economies. Fisheries, in particular, form the backbone of food security,

livelihoods, and commerce for millions of people. However, the pressure to meet the rising demand for seafood has led to overfishing, habitat destruction, and the depletion of fish stocks. With growing awareness of these challenges, the concept of sustainable fishing has gained prominence. But beyond the environmental necessity, sustainable fishing has significant economic implications. Balancing the need

for conservation with economic profitability is essential for ensuring the long-term viability of global fisheries.

## Overfishing: A Global Challenge

Overfishing occurs when fish stocks are harvested faster than they can reproduce, leading to a decline in population and, eventually, collapse. This has been a growing concern in recent decades, with the United Nations Food and Agriculture Organization (FAO) reporting that nearly 34% of the world's fish stocks are overfished, while another 60% are being fished at their maximum sustainable

- ▶ *Sustainable fishing ensures long-term profitability by maintaining fish stocks, preventing overfishing, and ensuring continuous yields for future generations.*
- ▶ *Sustainable fishing secures livelihoods of communities dependent on fisheries.*
- ▶ *Fisheries that adopt sustainable practices are better positioned to withstand environmental changes, market volatility, and regulatory shifts.*
- ▶ *Policies such as quota systems, fishing bans, and Marine Protected Areas (MPAs) help regulate fishing and support the recovery of depleted stocks.*



levels. The effects of overfishing go beyond ecological damage. Entire communities that depend on fisheries for their livelihoods face economic hardship when fish stocks collapse, especially small-scale fishers in developing countries, where access to alternative livelihoods may be limited. The collapse of a fishery can also result in higher prices for consumers and reduced seafood availability, impacting food security. Thus, overfishing is not just an environmental issue but it is also an economic one. The need to shift toward sustainable fishing practices is critical for ensuring the long-term health of the world's fisheries and the communities that rely on them.

### What is Sustainable Fishing?

Sustainable fishing refers to practices that maintain fish populations at healthy levels, ensuring that ecosystems remain productive and biodiversity is protected. It involves setting catch limits based on scientific assessments, reducing bycatch (the capture of non-target species), and minimizing damage to habitats. Sustainable fishing practices are designed to ensure that fish stocks can replenish themselves, allowing for continuous harvest without depleting the resource. Harvesting at or below the MSY ensures the long-term economic viability of a fishery, as fish populations remain healthy and productive. Maximum sustainable yield (MSY) is the largest yield (or catch) that can be taken from a

species' stock over an indefinite period and Maximum economic yield (MEY) is the level of catch that provides the maximum net economic benefits or profits to society.

### The Economic Benefits of Sustainable Fisheries

#### 1. Stable and Profitable Fisheries

Sustainable fishing ensures that fish populations are managed in a way that prevents over-exploitation, allowing them to replenish over time. This helps to avoid the boom-and-bust cycles seen in overfished areas, where temporary profits from overharvesting lead to long-term losses when stocks collapse. A well-managed fishery can provide stable catches year after year, ensuring consistent income for fishers.

#### 2. Increased Market Access and Premium Prices

As consumers become more aware of the environmental impact of their food choices, demand for sustainably sourced seafood is rising. Many retailers and restaurants now prefer to buy seafood certified by organizations like the Marine Stewardship Council (MSC) or Aquaculture Stewardship Council (ASC), which set rigorous standards for sustainability. Fisheries that meet these standards often gain access to premium markets and can command higher prices for their products.

#### 3. Job Creation and Diversification

Sustainable fishing practices can also lead to the creation of new jobs in

the seafood industry. As fisheries adopt more responsible management practices, there is a growing demand for professionals trained in fisheries science, stock assessment, and ecosystem management. In addition, the development of sustainable aquaculture (fish farming) as an alternative to wild capture fisheries has created opportunities for new businesses and employment. Aquaculture is the fastest-growing food production sector in the world, and when managed sustainably, it can relieve pressure on wild fish stocks while providing a stable source of income for fish farmers.

### The Role of Governments and Policies in Promoting Sustainability

While the benefits of sustainable fishing are clear, achieving it requires coordinated efforts from governments, industry stakeholders, and consumers. Effective fisheries management is crucial for maintaining fish populations and supporting the long-term economic health of fisheries.

#### 1. Quota Systems and Catch Limits

Quota systems help prevent overfishing by ensuring that fishers cannot harvest more than the ecosystem can support. When properly enforced, quota systems can lead to the recovery of overfished stocks and improve the economic performance of fisheries.

#### 2. Subsidy Reform

Many governments provide subsidies to their fishing industries, often in the form of fuel discounts or direct payments. However, some of these subsidies contribute to overfishing by encouraging unsustainable practices. Reforming harmful subsidies and redirecting financial support toward sustainable fishing initiatives can help reduce overfishing and promote long-term economic growth.

#### 3. Marine Protected Areas (MPAs)

Marine Protected Areas are designated regions where human activities, including fishing, are restricted or prohibited to protect ecosystems. While MPAs may limit fishing in the short term, they often lead to the recovery of fish populations, which can spill over into

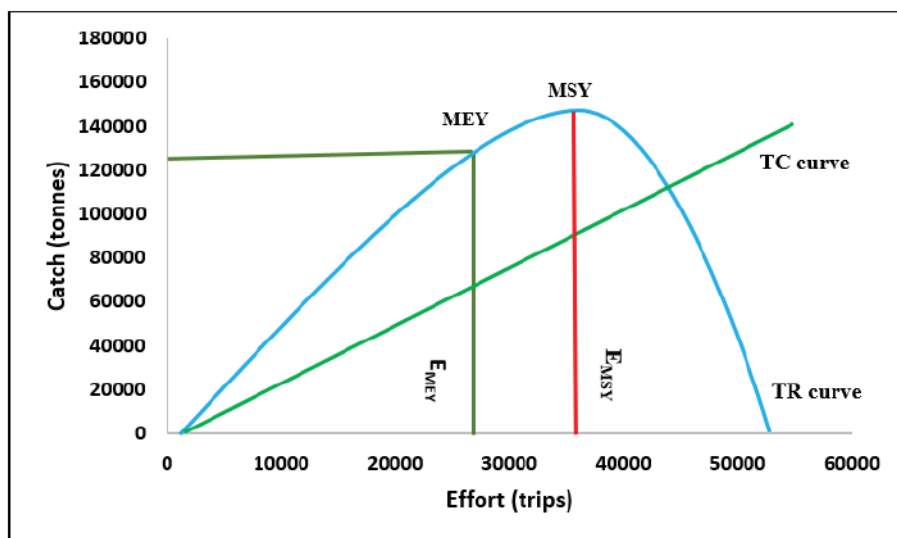


Figure 1. Maximum sustainable yield and Maximum economic yield

adjacent fishing areas, boosting catches and income in the long run.

#### 4. Fishing Ban

Imposing of fishing ban allows fish populations to regenerate, preventing overfishing and ensuring long-term viability. Fishing bans, when enforced properly, contribute to preserving biodiversity and maintaining ecological balance in marine ecosystems.

#### 5. Sea ranching

The sea ranching programme can help replenish depleted stocks and improve fishery yields. This practice complements natural reproduction and contributes to the recovery of fish populations, promoting long-term sustainability in marine resources.

#### The Future of Fisheries: A Balance of Ecology and Economy

Sustainable fishing is not just an environmental necessity but also an economic imperative. As fish stocks decline due to overfishing and environmental pressures, the long-term profitability of fisheries is at risk. By adopting sustainable practices, fisheries can ensure the health of ecosystems, provide stable incomes for fishers, and meet the growing demand for seafood. However, achieving sustainability requires collaboration across sectors. Governments must implement and enforce effective management policies, the fishing industry must adopt responsible practices, and consumers must demand sustainably sourced seafood.

#### Conclusion

The economic impact of sustainable fishing extends far beyond immediate profits. It is about ensuring the long-term viability of fisheries, protecting the livelihoods of millions, and preserving the oceans for future generations. By balancing conservation and profit, the fishing industry can lead the way in promoting both ecological and economic sustainability.

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

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