



Centurion
UNIVERSITY

*Shaping Lives...
Empowering Communities...*

SDG 14 | Report on Life Below Water

SDG 14

REPORT 2021



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Targets

1. Infrastructure

Centurion University`s School Agriculture and allied courses has helped to local and marginal farmers by setting up one seed processing unit. The school targets to establish a Food Testing Lab by 2023 which will befit the entire Eastern India belt for testing of medicinal produces and Marine farming.

2. Community Engagements-

The University had conducted 20 community engagement events to impart awareness on organic farming, agro-ecological farming practices, sustainable development in Agri and allied Agri sectors, Smart Agriculture, mushroom production and etc. The University targets for 10 more events by 2023.

3. Creating Job opportunity-

M.S Swaminathan School of Agriculture, CUTM has conducted farmer outreach programs to spread awareness among the young farmers to increase the economic benefits of pisciculture. The university intends to increase the number of workshops of this category from 5 to 20 by the end of 2023.

4. The university has attempted to conduct 23 events to address challenges faced by the farmers in the field of fish nutrition and feed composition, importance of maintaining good water quality, common disease encounter in the culture system. This aims at increasing the awareness programmes to 20 more numbers.

About Centurion University of Technology and Management (CUTM)

CUTM is the first private university in Odisha which was established through the CUTM Act 4 of the Odisha State Legislative Assembly in 2010. In due course, it has got recognition as Grade-A University by National Assessment and Accreditation Council (NAAC), Ministry of HRD (Annex 1) and 12 B status by UGC (Annex 2). Apart from SDG 14 the school contributes significantly to SDGs 1,2,4,12 and 13. The objectives of CUTM are shaping lives, empowering communities and co-creating wealth and livelihood opportunities in Left Wing Extremism (LWE) affected districts of South Odisha and North Coastal Andhra Pradesh. Teaching, training, consulting and research activities of the university are geared towards employability enhancement, employment generation through entrepreneurship development and preparing graduates for higher education. The University offers its education, training and other services through different Schools. CUTM has five campuses at Paralakhemundi, Bhubaneswar, Bolangir, Rayagada and Chatrapur It has more than 9,000 students in Undergraduate and post-graduate programs. It imparts employable skills to over 20,000 students annually in vocational programs.

The school of Fisheries is the only private institution in the fisheries sector in the State of Odisha imparting an undergraduate professional degree programme, Bachelor of Fisheries Science (B.F.Sc). The degree program started in the year 2017. The school is located at Parlakhemundi, Odisha.

Highlights:

The curriculum of the course is consistent with that of the other fisheries colleges in India, it is based on the recommendation of the Dean's Committee Report organized by ICAR based on the needs of the fisheries industry of the country. Currently the school is offering various courses related Fisheries which are taught in 5 departments. A total of 180 credit hours are presently offered to the students, out of which 140 credits hours is covered from 1 st to 6 th Semester the remaining 0 + 20 credit hour and 0 + 20 credit hours are offered to students during the 7 th and 8 th semesters under Experiential Learning and In-plant Training respectively. The school also invites visiting faculties from research institutes, academics and industries in order to familiarize the students to the latest developments in the field of fisheries.

A number of courses are being offered to its students as per the ICAR 5th Dean committee syllabus of ICAR, New Delhi. Although most of the courses in the syllabus deal with the aspect of protection, conservation and sustainable use of aquatic resources, the courses of which mostly accords to the SDGs are listed below:

1. Aquaculture in Reservoirs
2. Soil and Water Chemistry
3. Limnology
4. Aquatic Ecology, Biodiversity and Disaster Management
5. Fishery Oceanography
6. Aquatic Mammals, Reptiles and Amphibians
7. Aquatic Pollution
8. Fisheries Policy and Law
9. Fish Population Dynamics and Stock Assessment

The school also fosters farmers training and participation through organizing conferences and workshops, where the sustainable use of natural resources like promotion of zero water culture, Biofloc culture

(<http://courseware.cutm.ac.in/wp-content/uploads/2020/06/C18.pdf>), Organic aquaculture, use of herbal medicines and avoidance of antibiotics are promoted. The school organizes different training programs and presentations by eminent experts.

The school had organized a three day All India Training and Demonstration Programme on “Healthy Shrimp and GIFT Tilapia Culture Using Biofloc Technology” at Centurion university campus, Bahanaga, Gopalpur, Balasore in association with National Fisheries Development Board, Hyderabad and Tamil Nadu Dr. J. Jayalalithaa Fisheries University, Nagapattinam, Tamil Nadu on 27.08.2018 – 29.08.2018.

Dr. Latha Shenoy P.S. (Retd.), FRM Division, ICAR-CIFE, Mumbai, a well-known scientist in the field of fisheries resource management in India has delivered her lecture on the topic Current Status and Road to Sustainable Marine Fisheries Development in India. She started the lecture by highlighting the important role of fisheries in the Indian economy and marine fisheries resource potential in India. She provided details about the issues in marine fisheries, such as about 60% of global fish stocks are fully fished, 30% is overfished and 10% is underfished. She also spoke about overfishing (biological overfishing, growth overfishing, recruitment overfishing, ecosystem overfishing), destructive fishing, bycatch/discards, climate change impact, etc.

Many program are been initiated under this school and every year we do more than 15 events. This year we have done 23 events and the important few events and initiatives are as below-

Initiatives by CUTM for promoting best water irrigation practices and water management/conservation

Kissan Mela

School of Fisheries with M.S. Swaminathan School of Agriculture, had organized “Utkal Krishi Mela”. The theme for the mela was “Explored the Unexplored Affluent Agri Odisha”. Technical session where interaction between farmers and Subject Matter Specialist discussed about the scientific culture system, how to solve problems faced by the farmers in the field, fish nutrition and feed composition, importance of maintaining good water quality, common disease encounter in the culture system.



It also focused on Feed Formulation for Sustainable Aquaculture. As aquaculture production of tropical fish and crustacean species becomes more intensified, practical diets need to be formulated to be cost effective and environment-friendly. Ingredients should be included to satisfy the nutrient requirements of the animal, promote optimal fish growth, and boost the income of small-scale farmers and commercial producers with minimal impacts to the surrounding environment. Feed formulation for sustainable aquaculture should aim at increasing aquaculture system performance and profitability, enhancing the animals' disease resistance, increasing attractability, palatability, and digestibility of practical diets, and maintaining environmental quality through sound feeding management and good aquaculture practices.

The School of Fisheries had set up a stall and showcase an advance aquaculture practices like Aquaponic, Recirculatory Aquaculture System, flow through based raceway system were demonstrated to farmers in terms of model. Interaction of faculties and students with visitors in stalls about the technologies displayed in the form of models and posters. Pamphlet was also distributed to the visitors of the stall which contain about intensive aquaculture system, new technologies and innovation and value added fish products. From department of Fish Processing Technology value added fish products like fish papad, fish chakli, prawn pickle, squid pickle were shown and distributed to farmers. Further, fish by-products like chitin, chitosan, fish oil, fish mows and fish protein concentrate were also introduced to farmers. By-products, which not only led to development of new products but also helps to reduce waste disposal into the environment.



TRAINING OF FARMERS IN COLLABORATION WITH AGRICULTURAL TECHNOLOGY MANAGEMENT AGENCY (ATMA)

School of Fisheries, CUTM had organized a farmers training program with ATMA with 75 farmers as participants in the training. The focus of the training program was to impart scientific knowledge related to fish farming, familiarization with new and advanced technologies in fish culture and post-harvest technology. Day-1 of the training session discuss on topics related to selection of species for aquaculture in the area, scientific aquaculture practices, importance of water quality, maintenance of ornamental fish unit, fabrication of aquariums and how it can be a form self-employment as it does not require a huge capital investment. The participants have a visit to the fish rearing unit of the school where rearing of ornamental fish are done in tank and Amur carp in a cemented tank. They are also shown the model of Aquaponics, biofloc culture system and the techniques involved are explained to them. The day was ended with an interaction between farmers and Subject Matter Specialist where the curious question from the farmers mostly about the new methods of fish cultivation, problems faced during the winter season and investment into the ornamental fish sector.

AQUAPONICS: A sustainable methods of raising both fish and vegetables. It is a form that combines raising fish in tanks (recirculatory aquaculture) with soilless plant culture (hydroponics). In aquaponics, the nutrient-rich water from raising fish provides a natural

fertilizer for the plants and the plants help to purify the water for the fish. Aquaponics is a great example of year 'round, indoor farming. It can be done anywhere, providing fresh local food that is free of pesticides, herbicides and chemical fertilizers.

BIO-FLOC CULTURE SYSTEM: Biofloc Technology (BFT) is considered as new “blue revolution” since nutrients can be continuously recycled and reused in the culture medium, benefited by the minimum or zero-water exchange. BFT is an environment friendly aquaculture technique based on in-situ microorganism production. Biofloc is the suspended growth in ponds/tanks which is the aggregates of living and dead particulate organic matter, phytoplankton, bacteria and grazers of the bacteria. It is the utilization of microbial processes within the pond/tank itself to provide food resources for cultured organism while at the same time acts as a water treatment remedy. Thus, this system is also called as active suspension ponds or heterotrophic ponds or even green soup ponds.

Day-2 of the training begins with participants visiting the grow-out culture ponds of the school where mixed of Indian Major Carps are reared. The participants are explained on the importance of nutrition in a fish culture system. The formulation of feed using locally available materials to decrease the cost of production as feed cost has been a major problem contributing about 60% of the production cost. The participants are then explained about the post-harvest handling of fish in order to maintain the quality of the fish, importance of ice to delay spoilage, reason for the need of proper sanitation and hygiene in fish handling after harvesting. They further have hands-on training on the preparation of fish pickle, shrimp pickle as fishery value-added products.

Community outreach program organised by CUTM for Safe and Sustainable fisheries

Farmer awareness program

The School of Fisheries, Centurion University of Technology and Management, Paralakhemundi, Odisha has organized a KisanMeladuring. The major objectives of the ‘KisanMela’ were to make aware the farmers about the sustainable technologies for better production and to guide them for embracing new scientific and economic techniques. The programme has started with an exhibition that included tableaus by different schools.

Marine fish production has been dwindling for years; aquaculture is only hope to feed increasing human population. Fish is the cheapest form of protein available for human consumption. Since fish farming can be integrated into the existing farm to create additional income and improve its water management, the School of Fisheries highlighted the theme “Blue Economy: Better farming for better lives”, emphasizing sustainable and resilient technology interventions to increase fish production, thus increase job opportunities and reduce poverty and hunger. This programme was part of our school efforts to achieve sustainable development goals (SDG:1 No poverty, SDG:2 Zero Hunger, SDG:14 Life below water).The school exhibited fish aquariums, fishery byproducts (chitin, gelatin and fish oil) along with models of cage culture, carp polyculture, fishing vessels, aquaponics unit. The school also displayed posters on candidate species for cage culture, steps to prepare a fish pond, fertilising and liming of ponds, conditioning, packing, transporting and stocking of fingerlings into the pond. An interactive farmer’s meet was also



held between farmers, students and the experts from the school in order to understand the challenges faced, and to disseminate the knowledge on how to tackle them. During the farmer meet, faculties emphasized the untapped potential of water resources, importance of fish farming over other farming activities, types of fish farming, subsidies available for fish farmers, opportunities and scope of aquaculture in near future. The aspiring fish farmers were interested to know about integrated fish farming and cage culture and asked for any training. Few of them were already doing their paddy cultivation; integrating fish farming will give additional income with less cost. The basis of integrated fish farming is the idea that "there is no waste," only misplaced resources that can be turned into valuable components for other products. It also provides off-season employment to the farmers and farm labours and promotes better paddy production by way of exercising an effective control on unwanted weeds, molluscs, noxious insects and their larval stages. Similarly cage culture can also be taken up by the aspiring farmers when existing body of water including lakes, reservoirs, ponds, strip pits, streams and rivers is available for use. It has advantages of relatively low initial investment is required, easy to do sampling and harvesting, less manpower required, job opportunities for unemployed and additional income during closed season. Around 600 farmers were actively participated in the Mela and visited the stalls located at the campus. The Kisan mela proved to be a great success for the farmers of Gajapati district.

Webinar on “Technical Interventions on Sustainable Aquaculture”

CUTM’s School of Fisher organises many awareness creation seminars. Few among them are as below.

A webinar entitled “Technical Interventions on Sustainable Aquaculture” was hosted by the School of Fisheries, Centurion University of Technology and Management (CUTM), The speakers as well as the attendees and emphasized theme of the webinar and its importance. Major topics for discussion were culture potential of indigenous shrimp species; intensive culture technologies and organic farming for shrimps; aquaponics technology for integrating aquaculture and agriculture; induced breeding, hatchery management and grow-out rearing technologies for catfishes and economically important marine fishes (pompano and grouper); the production challenges and entrepreneurial potential in the field. The webinar was attended by 96 registered participants, representing students, researchers and faculties from different research organizations, central Institutes and state universities.

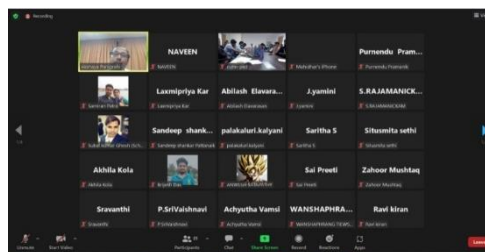


Webinar on “Advances in Sustainable Aquaculture”

The School of Fisheries, Centurion University of Technology and Management (CUTM), Paralakhemundi, achieving Sustainability in Aquaculture and Fisheries”. The speakers and attendees, and emphasized the university efforts in attaining SDG goals by increasing awareness through various means. The speakers as well discussed about the importance of small scale fisheries in livelihood generation of fisherfolk, usage of ecopath and ecosim models fisheries management to achieve sustainable fish harvest. They emphasized the potential of cage culture, candidate species for cage culture, feeding, and disease management in cage culture operations. Many participants attended the webinar, representing students, researchers and faculties from different research organizations, central Institutes and state universities.

Awareness Programs on Sustainable Fishing

An awareness programme on Sustainable fishing practices was organized by the students and faculties of the School of Fisheries, Centurion University of Technology and Management for the fisher community. The programme aimed to aware the fisherfolk about overfishing, ghost fishing and its impact on fish stock. The event emphasized about the declining population of different species of fishes in Odisha and instructed the fishermen to follow sustainable fishing practices, fishing ban season and mesh size regulations and also advised to use bycatch reduction devices.



The marine fish production from inshore waters has reached a peak situation, and some fishery resources are even overfished. Overexploitation of resources caused by use of devastating gears and methods of fishing has caused tremendous pressure on the fishery resources. Reduction in the quantity of catch per unit effort is caused by the depletion in the stock of resources coupled with the increasing cost of fishing inputs. In fishing operations, the increased cost of fishing per trip, the reduced catch and subsequent decline in the gross returns per trip have become important constraints affecting the economic returns from different fishing methods. To increase marine capture fisheries production further, inshore fishery resources must be wisely managed. Similarly, harvested resources must be used properly by utilizing or improving shore-based facilities, implementing the Code of Conduct for Responsible Fisheries (CCRF), engaging in participatory management, and diversifying to deep sea fisheries.

Any discarded, lost, or abandoned fishing gear in the marine environment is referred to as 'ghost gear' and are posing threat to aquatic animals, contributes merely 5-30% decline in fish stocks. A vicious cycle happens when fish are caught in ghost nets, as they frequently die and attract scavengers in to the same net. The lost gear remains active underwater, catching and killing animals and capturing anything in its path in an unsustainable manner. Therefore the fishermen were advised to adopt fishing methods that are environmentally sustainable, socially acceptable, and economically viable in order to meet the goals of the United Nations Sustainable Development Goals (SDG 14).

Fishes migrate between aquatic environments for variety of reasons; one among them is for spawning purpose (eg. Hilsha). During peak spawning season, these fishes migrate in shoals and taking advantage of this behaviour, fishermen target these shoals, result in recruitment overfishing. Decline in the fish catch and increasing cost of fishing put the fishermen in to alarming situation to exploit even juvenile's fishes to meet their livelihood. Maintaining a minimum stock balance in the ecosystem is essential for attaining sustainability in long run. The fishermen were also urged to avoid use of destructive fishing gears (mosquitoes mesh sized gears) and avoid harvesting brood fishes and juveniles. The fisherfolk of the local fishing region were actively interacted with students and staffs of School of Fisheries, Centurion University of Technology and Management (CUTM).



Awareness Programs on Conservation and Sustainable utilisation of the oceans

Beach cleaning program

Public or community services are tended to learn good subject in university levels for students because this will make a great awareness for them so that they will lean towards to help others in the future. However, the school of fisheries, Centurion University of Technology and Management also focuses on the overall development of the aquaculture/fishing communities by its student's involvement. Several programs have been conducted along with the beach cleaning in nearby fishing areas.

The students and staffs of SoF Centurion university of technology and management and local people cleaned one of the most important beaches of the locality. They collected Plastic food wrappers, Plastic straws, stirrers, utensil, beverages bottles, plastic bags, plastic cups and plates, non-degradable waste, including thermocol and industrial waste and handed them over to City Corporation. The students and staffs have gone there along with banner and make them aware about usage of plastics, sanitation and hygienic benefits and side by side harmful effects of non-biodegradable materials that directly and indirectly dumped into the sea and requested the inhabitants to evade the usage of plastic and other harmful materials.

Offering to clean up the coastal areas near beach in any part of our country is much more important than just picking trash up off the coastline. Regularly keep on practicing and making as regular work, it brings community together and raises awareness of plastic pollution, and also acts as best part of our daily life that anyone can do it. The event beach cleanup is does not very expensive but only our responsibility is to do for small arrangements of organization and devoted volunteers.

As we are aware that plastic is non-biodegradable material, that piles up in oceans ends up releasing toxins into the water, causing severe life aquatic animals thereafter, fish ingesting plastic are prone to stunted growth, tumours, less successful reproduction and lower ability to protect against predators. The only way to fight this issue is by cleaning up all the plastic that we find on the beach and preventing it from going into our oceanside. While this may seem like a discouraging duty for a person to handle by themselves, but it can be done easily when we have a group of motivated people helping us out. Therefore, sanitizing different water bodies such as beach side of sea and ocean would intensely reduce these

destructive effects, while concurrently improving health, jobs, climate and economy. Social media is only way today that can connect the target people. Social media is a priceless tool for getting the word out about our beach cleanup event and its social welfare. However, we have also applied same appliances and spread our ideas and themes to different communities.

As a conclusion hosting a beach cleanup is a part of social and environmental welfare that directly and indirectly saves our surroundings and coastal water resources. However, we should spread these events to the community through several social media such as on Facebook, twitter, and share with local businesses, friends and family members.

Awareness training program on responsible fish handling

The school of fisheries, Centurion University of Technology and Management is inclusive involved in all activities that helps in fisherman/fisherfolk development that enhance the production of fish and fisheries products and simultaneously highly concerned about fisherman communities' development and their empowerment. By involvement of School of Fishery students and staffs successfully organises awareness training program in fishing communities' every year. The participants with banner spread the knowledge of fish quality management before, after and during fish harvesting. The quality of fish can be better controlled and shelf-life substantially increased through the introduction of a uniform cold-chain system and hygienic handling practices from harvesting to marketing. Trained them for icing fish just after harvesting because icing is the oldest and simplest method of fish preservation. Later discussed about importance of hygienic handling of fish onboard. It is obligatory that fishermen and other people who handle fish in harbours and landing centres have to follow the rule and basic concepts of hygiene and sanitation. Thereafter at the end delivered concept regarding hygienic handling of fishes at pre-processing centre.

Students and staffs taught them by using banner and some video clicks in mobile about why hygienic handling is required and mentioned following points.

- I. Fish or any process product reach the consumer in highly acceptable condition, and it is more important if the fish is intended to further processing i.e., the quality and acceptability of the end product depend on quality of raw material.
- II. In this case, the quality of the product reaching the end user will greatly depend on how the fish was handled onboard the vessel, how it was **preserved, packaged, and transported** etc.
- III. Extreme care is needed in handling, preserving, and storing fish onboard.

Thereafter dealt about onboard fish handling. The main factors affecting the quality of fish onboard are

- I. Cleanliness of the deck and fish holds
- II. Quality and quantity of water used
- III. Temperature at which fish is maintained
- IV. The general handling practices adopted
- V. Cleanliness of the equipment and utensils use in handling, packaging and storage.
- VI. Personal hygiene of the fish handlers

Instantly after unloading the catch washed well to remove the dirt and other extraneous matter. After washing, the fish must be sorted species wise as also size wise. Gills

and viscera of the fish are removed before they are preserved and stored. Evisceration should be complete with no portion of it left out in belly. After washing and bleeding icing has to be done. Icing best method of preservation of fish onboard involves lowering its temperature. Ice (<0°C) keeps fish cool, moist and glossy and controls deterioration. At the event of unloading personal hygiene, materials (boxes, utensils, equipment) all should be sanitized and disinfectant. After all these activities fish are going for processing. First of all, conditioning is required. The conditioning process reduces stress, inhibits metabolism and at the same time food remains are removed from the alimentary ducts and the oxygen demand reduced. Currently, special tanks with an aeration system and often with cooling and filtering systems are used for transportation of live fish. In other side variety of fish products can be made by passing through different steps such as grading, removal of slime, scaling, washing, beheading, gutting, filleting etc.

Food Security Policies

Policy No-1

This policy sets out our approach to supporting food systems that are environmentally, socially and economically sustainable. It contributes to a range of university commitments, which says the University will ensure that its actions and activities deliver positive change, our Climate Strategy, which describes how the University will respond to climate crisis, and our pledge to work with partners to advance the Sustainable Development Goals. Good Food is food and drink that is tasty, healthy, good for the environment and good for the people who make it. It is produced, purchased, transported, consumed and disposed of within food systems that are:

1. Environmentally sustainable by conserving or regenerating natural resources; avoiding pollution; mitigating emissions that cause climate change; protecting biodiversity; and upholding the highest standards of animal welfare.

The University will adopt a whole-institution approach to Good Food by taking action within five key areas - Sourcing; Provision; Practice; Research, Learning & Teaching; and Leadership & Culture.

COMMITTED TO BE ENVIRONMENTALLY SUSTAINABLE

1. Sourcing - The University will source food and drink that is produced to environmentally, socially and economically sustainable standards by; Using traceable ingredients that minimize harm to the environment from local suppliers who meet the standards. Upholding our Fair-Trade Policy by sourcing products from fair and ethical supply chains. Championing food that is produced and manufactured in our local community (from small and medium enterprises, third sector and supported businesses where possible). Using and highlighting seasonal ingredients on our menus.

Policy No-2

This policy sets out our approach to supporting food systems that are environmentally, socially and economically sustainable. It contributes to a range of university commitments, which

says the University will ensure that its actions and activities deliver positive change, our Climate Strategy, which describes how the University will respond to climate crisis, and our pledge to work with partners to advance the Sustainable Development Goals. Good Food is food and drink that is tasty, healthy, good for the environment and good for the people who make it. It is produced, purchased, transported, consumed and disposed of within food systems that are;

2. Socially sustainable by fulfilling every person's right to adequate, healthy, safe, nutritious, good quality and appropriate food; providing people with opportunities to enjoy and learn about Good Food; and encouraging diverse food cultures.

Our commitments

The University will adopt a whole-institution approach to Good Food by taking action within five key areas - Sourcing; Provision; Practice; Research, Learning & Teaching; and Leadership & Culture.

COMMITTED TO BE SOCIALLY AND ECONOMICALLY SUSTAINABLE

1. Provision - The University will provide good value, high quality, healthy and sustainable food that meets dietary needs and enhances the wellbeing of staff and students by;
 - a. Serving nutritionally balanced, freshly prepared food.
 - b. Offering better quality meat and attractive vegetarian and vegan options.
 - c. Raising awareness of healthy, sustainable choices (including meat-free options) and helping people make informed decisions by highlighting the provenance, seasonality and other sustainability and health aspects at the point of sale.
 - d. Publishing nutritional information for all menu items.
 - e. Actively encouraging water consumption and discouraging bottled water purchases by providing accessible tap water points across the University.
2. Practice - The University will act responsibly towards the environment and people employed in our supply chains, and we will our influence our suppliers to do the same, by;
 - a. Saving energy and water by efficiently managing our facilities and events. All new and replacement kitchen equipment will be electric (or induction where financially achievable).
 - b. Supporting the University's Zero Waste ambition by minimizing food and packaging waste wherever possible. This will include removing single use disposables from university catering at every opportunity, discouraging the use of disposable items, exploring circular economy initiatives and ensuring no edible food is wasted.
 - c. Working with suppliers to reduce negative environmental impacts, including transport emissions, packaging and food waste.
 - d. Encouraging our suppliers to consider fair work practices and to subcontract or source according to best practice. We aim to leverage our relationships with local suppliers to promote fair work practices within the region.
 - e. Encouraging staff and students to conserve resources.
3. Learning, Teaching & Research - The University will support initiatives that deepen understanding, collaboration and action on Good Food by;
 - a. Encouraging opportunities for staff and students to learn about sustainable food and gain practical skills.
 - b. Supporting staff and student-led activities that enhance the University's food culture (e.g. food growing on campus, resource efficiency initiatives and shared actions with

the Students).

- c. Supporting research and teaching on sustainable food systems and use research to improve University practice.



Awareness programs on Sustainable maintenance of ecosystems and their biodiversity

Finfish and shellfish breeding program

The school of fisheries of Centurion University of Technology and Management regularly conducts training and awareness program for the students and farmers welfare to promote the getting sound knowledge of fisheries and aquaculture aspects. A group of students are sent to ICAR-CIFA and we had hands on orientation training on catfish breeding and seed production. Subsequently, necessary arrangements were done by our college for the successful In-plant training at the ICAR-CIFA Bhubaneswar. At ICAR-CIFA Bhubaneswar where they attained great ideas of successful breeding and rearing of catfish. There they have learned about Asian catfish and pangasius breeding, prawn, artemia as well as pearl culture. *Pangasianodon hypophthalmus* culture is one of the major and fastest growing fish farming in all over the world. *Pangasianodon hypophthalmus* is commonly known as striped catfish.



Students of School of Fishery, CUTM learned about artemia production by taking cyst (15g) and done following experiment

Hydration is performed for breakdown of chorion of freshwater with vigorous aeration is given for 30 mins to resume the embryonic development of the cyst.

Decapsulation – Sodium Hypochlorite is used to soak the eggs for 2- 3 mins

Dichlorination- Eggs are washed with plenty of running freshwater to remove excess chlorine which may lead to mortality.

Hatching – The required salinity for hatching is 30 ppt therefore the eggs are stored in salinity of 30ppt with vigorous aeration for 24hrs.

Nauplii collection – The next day when the eggs are hatched the nauplii are collected with projecting the light to a point as the artemia is photopositive in nature and will accumulate at a point which is then siphoned without the cyst remains. Washed with freshwater and fed to the larvae. Later they learned few advanced aquaculture technologies like Recirculatory



aquaculture system. In that the experimental RAS system has 12 no's of glass tanks 6 in each row. The inlet has an overhead tap and outlet is gravity based. The sides of glass tanks are covered to avoid unwanted light penetration. The outlet water gets purified and recirculated. There are two types of filters involved- mechanical filter – sponge filter, bio filter – Substrate and aeration. The filtered water gets collected in the sump. Thereafter they visited nearby hatchery such as ornamental unit, prawn unit and pearl culture unit.

SURVEY ON SITA SAGAR

Sitasagar reservoir is located in the Gajapati district of Odisha. The reservoir is spread over about 67.211 hectares in the Paralakhemundi block. The reservoir is surrounded by a town with an inlet of polluted drain water of the locality. The faculties and students of the School of Fisheries, Centurion University of Technology and Management have continuous monitoring and evaluation of the water bodies. The school primarily focuses overall development of the fishing communities through the ecosystem approach to fisheries management. The ecosystem is managed by following the state fisheries policy.

The physical condition of the reservoir was contaminated with the domestic, hospital, and municipal waste drained into the system. Several programs have been conducted for improving the physicochemical properties of the waterbody with the involvement of residents, SHGs (Self Help Groups), and LSGD (Local Self Government Department) to maintain the water bodies in a good condition. The school is working towards the socio-economic development of the fisherman communities by implementing various programs and providing training and conducting extension activities.

The continuous activities taken up by the schools in the reservoir are regular monitoring of the water bodies by assessing the biodiversity and water quality parameters. For analyzing water quality parameters water samples are collected from the reservoir site and analyzed at the aquaculture laboratory of the school of fisheries. Weekly samples are collected and analyzed for the major parameters necessary for fish production like Dissolved Oxygen, Biological Oxygen Demand (BOD), Ammonia, pH, Temperature, Hardness, Alkalinity, etc. For assessing the biodiversity monthly sampling is done by collecting finfish, shellfish, and water and soil samples for plankton and benthos analysis.

Since the waterbody have quite a low DO (1-2 mg) and high BOD (4-5 mg/l) awareness program are conducted frequently for the residents in the reservoir premise to avoid water pollution by garbage and sewage discharges directly into the water body. It is necessary to restore the natural drains and actions are taken up to *in-situ* measures like de-silting, de-weeding, surface aeration etc. for improving the ecosystem quality.

The cleaning program is also conducted frequently by the school in the reservoir premises with the involvement of students, staff, stakeholders, SHGs, and LSGD. In this it is mainly focusing on the removal of plastics in and outside of the reservoir and weed plants removal etc. from the reservoir site. Studies and surveys are also conducting to know the suitability of aquaculture in the reservoir. The suitability of species enhancement by ranching can also be studied by School.

Technology based researched for Safe and Sustainable fishing practices

The commitment of School of Fisheries, Centurion University of Technology and Management towards the sustainability of fisheries is reached by development of sustainable development of aquaculture technology and seafood waste and by-product valorization.

The sustainable goals of the school are met by focusing on,

- 1) Induced captive breeding of Indigenous fishes with prime focus on Indian major carps.
- 2) Seafood by-product and waste obtained from fish valorisation by,
 - a) Gelatine extraction from wastes like fish scales obtained from fish market
 - b) Preparation of fish oil and fish meal from fish head waste
 - c) Fish meal from fish waste obtained from fish landing centres
 - d) Utilizing the fish meal prepared from fish waste for the aquaculture

**National webinar on
Technical Interventions for
Sustainable Aquaculture**
29/6/2022
10 am -12 pm
& 2 pm - 4 pm

**Centurion University of
Technology and Management
SCHOOL OF FISHERIES**

Speakers

ORGANISERS

Dr. Sunita Pattanayak
Vice-Chancellor, CUTM

Organizing Secretary
Dr. S. P. Mandal
Dean, School of Fisheries, CUTM

COORDINATORS
Dr. Sambid Swain
Dr. S. R. Reddy
Dr. Neelirajam Sushila
Mr. Pitam Tapshy

Speakers

Dr. Anil Kumar
Professor, ICAR-CIFA
Development of Freshwater Aquaculture

Dr. R. K. Nair
Professor, ICAR-CWBR
Enhancement of Water Productivity through Integration of Aquaculture and Agriculture

Dr. Rishabh
Senior Scientist, ICAR-CWBR
Bloodstock development and seed production of Indian pompano and grouper

Dr. S. Feroz Khan
Senior Scientist, ICAR-CWBR
Entrepreneurship opportunities in catfish farming technologies

Registration
Fee: Rs. 200
(Hard copy of the certificate will be provided)

Registration Link :
<https://forms.gle/2h3gFR7B6FDV7>

Meeting Platform : Google Meet | 8807774760 | sambid.swain@cutm.ac.in

- 3) Others: Knowledge sharing about responsible fishing, marine life responsibly etc. nutritional importance of fishes; Limiting the use of single-use and disposable plastic products; collaboration and participation in beach and waterbody clean-ups along with limiting Ocean acidification etc.

NAVEEN | **Feroz Khan, CIFA** | **Mahidhar's IPH...** | **Purnendu Pram...**

Farming Area status and projection

Area under culture: 2.20 lakh ha

Potential infrastructure and area is enough for producing 10 lakh tons by improving productivity which is decreasing over the last five years.

For additional production of 4 lakh tons - av. (Assumed av. Production: 5.0 tons/ha/year) inland saline

- A productive water resources suitable for agriculture, which do not compete with agriculture and drinking purpose
- Resource potential in the tune of 1.2 million ha & inland saline areas - 8 million ha
- Tropical Climate, Rich species diversity and Availability of man power
- Fisheries professionals and committed backbone & State Govt.

Total Potential area: 1,19,09,000 ha
Total area developed: 1,76,000 ha
Traditional-45,000 ha

Figure 1: Webinar Flier

- 4) Collaboration with different organizations:
Eg. ICAR-Central Institute of Freshwater Aquaculture, Bhubaneswar, Odisha, India for knowledge sharing and collaborative research focusing on sustainable aquaculture by applying modern techniques.
- 5) National Webinar was conducted on the theme of "Technical Interventions for Sustainable Aquaculture" where eminent speakers from central institutes such as ICAR-Central Institute of Brackish Water Aquaculture, ICAR- Central Institute of Fisheries Education, ICAR- Central Marine Fisheries Research Institute and ICAR- Central Institute of Freshwater Aquaculture, shared their knowledge on the topics like Diversification in Brackish water Aquaculture, Enhancement of Water Productivity through Integration of Aquaculture and Agriculture, Bloodstock development and seed production of Indian pompano and grouper, Entrepreneurship opportunities in catfish farming technologies which help in sustainable development of Aquaculture by applying modern techniques.

The expert explained about the overall production status and the major producers of aquaculture. He emphasized mainly on the diversification of brackishwater aquaculture to promote research and culture of potential native shrimp species to overcome the over-reliance on the single species. About the induced breeding technique of different commercially important catfishes such as Magur, Singhi, *Mystus* and *Pangasius*. He elaborated on the captive breeding, seed production and grow-out culture of these catfishes was as well described by the experts. The induced breeding technique of Indian pompano and orange-spotted grouper was explained by the experts. Successful breeding of these species was conducted at ICAR-CMFRI. All these information enhanced the knowledge of the students and faculty participants towards the sustainable aquaculture.



Presentations on different



Figure 2: Presentations and participants in the webinar

Induced captive breeding of Indian Major Carp

The wild grown fishes belonging to group of Indian Major Carps were induced bred in the carp hatchery in the School of Fisheries. Generally, the parent fishes are well maintained in special ponds with application of special feed. But in Centurion University of Technology and Management, School of Fisheries attempted induced breeding of wild grown fishes and obtained positive results. Artificial hypopysation of carps was carried out for the induced breeding. The entire method was carried out by taking the number of breeding pairs as per guidelines. The breeding program was successfully done by the students and they were able to get 10000 litres of carp eggs. The fingerlings grown from induced breeding of fishes are released into the wild thus helping in conserving the endangered fish species. The induced breeding program carried out in the School of Fisheries is hope for sustainable development of fisheries of wild grown fishes. This can also improve the fish numbers in the ponds, lakes and reservoirs which will help nature and local fishermen.



Figure 1. Fish breeding program at School of Fisheries, Centurion University of Technology and Management

Fish waste and by-product valorization

There is a huge amount of fish waste being produced in fish landing centres, fish markets and also in seafood industries. At School of Fisheries, CUTM, we demonstrated that these by-products can be utilized for production of high value products instead of just discarding as waste or using for fish manure.

Large number of fishes mainly the Indian Major Carps are sold in the market in Paralakhemundi. Huge amount of scales are obtained while cleaning the fish before selling the fish to customer. These scales having no value are just thrown away as waste. These fish scales are very good source of gelatin which is a very high value product used in food and pharmaceutical industry. The fish scales were collected from the fish market and brought to School of Fisheries. They were cleaned properly and gelatin was extracted after deproteinization and demineralization. Thus, sustainable conversion of waste to value was demonstrated.

Similarly, fish head also discarded as waste in fish markets and restaurants during trimming of fish into different styles. These heads were collected and utilized for the production of fish oil and fish meal. Fish meal has high protein content and used in the animal feed. Fish oil has important micronutrients such as vitamin A and D and hence has the pharmaceutical value. The total fish waste and by-product obtained in fish landing centres were collected for fish meal production which will ultimately be utilized for the feeding in aquaculture ponds. Thus, utilization of fish waste and by-product for food and feed and circular transfer into the aquaculture results in zero waste which is best example for the sustainable development of fisheries.

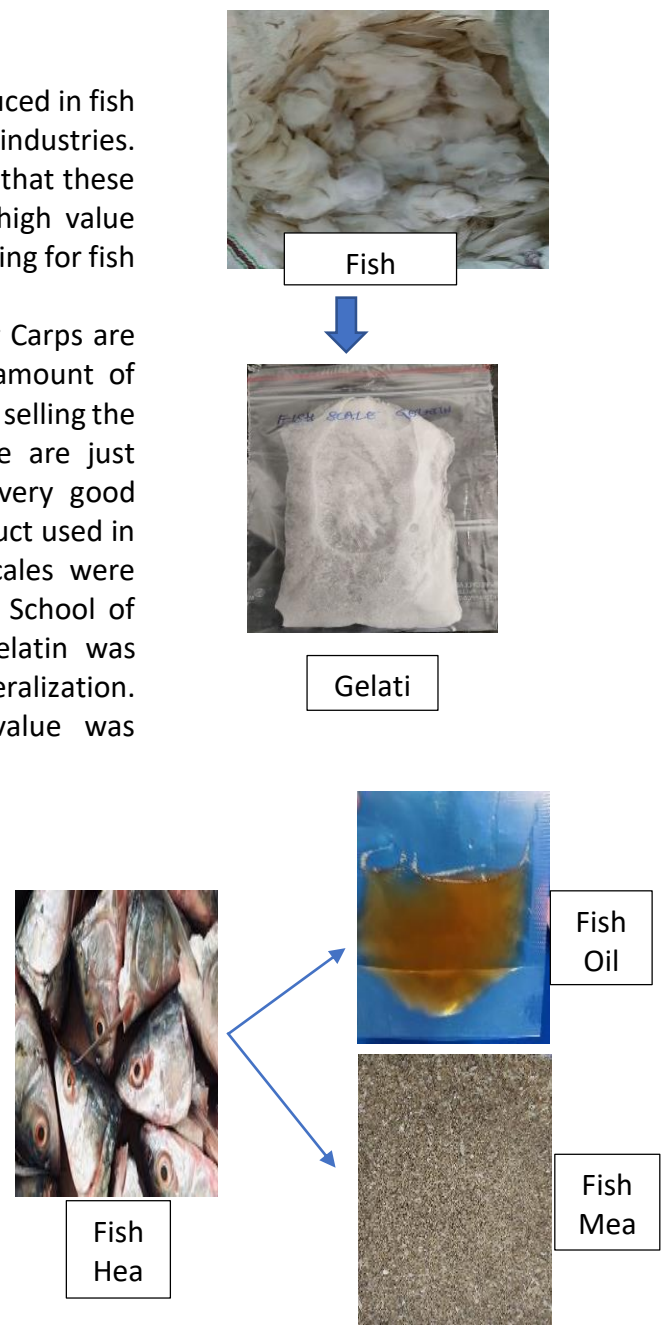


Figure 2. Fish waste valorization at School of Fisheries, Centurion University of Technology and Management

Courses on maintain water quality and ecosystem

Some of the important courses taught at Centurion University of Technology and Management related to the above-mentioned area are:

1. Water and soil quality management in aquaculture

Web Link: <http://courseware.cutm.ac.in/courses/water-and-soil-quality-manegement-in-aquaculture/>

2. Monitoring of water quality

Web Link: <http://courseware.cutm.ac.in/wp-content/uploads/2020/05/water-quality.pdf>

3. Soil and Water chemistry

Web Link: <http://courseware.cutm.ac.in/courses/soil-and-water-chemistry/>

4. Soil and Water Conservation through Watershed

Web Link: <http://courseware.cutm.ac.in/courses/soil-and-water-conservation-through-watershed/>

5. Aquatic Pollution

Web Link: <http://courseware.cutm.ac.in/courses/aquatic-pollution/>

The Campus and water

The university campus has massive use of water at different hostels, staff quarters and office. The campus is using a total of 279000 lit/day, which is a big amount cannot be ignored. Hence water treatment is matter of concern. Looking towards requirement of water for human, animal and agriculture use, the university has set its own Sewage Treatment Tank (STP) inside the campus.

Looking towards the massive use of water, water treatment plant is required in the campus. In case of water crisis the treatment water can be used for gardening farming purposes. Centurion campus has a very big garden of about 5 acres which needs lot of water and the water from the treatment plant can be used for gardening. Our campus borrows water from a very far place which is highly expensive. During rainy season a large amount of water wasted by flowing through drainage which can be used by the campus through treatment process. Since there is B.Sc. Agriculture in the college the treatment water can be used by the students for plantation. Many new buildings are being constructed inside the campus which needs a large amount of water for curing the bricks and watering the foundation, wall and slab. To certain extent the treated water can meet the demand of construction works. During summer the water supply to the hostel is just time to time and not regular so treatment plant is highly essential to this site. Thousands of gallons of water is used by the students, staff and mess members lot of water is wasted through drains so, constructing a treatment is very important. The drain water is deposited in the tank but of no use after the tank is filled the water is removed and wasted. Since there is a hill nearby our site there comes a large amount of surface runoff water which can be treated for our domestic use. To avoid further future a problem regarding water a waste water treatment plant is definitely required.

It is essential to access the quality of the waste water coming from the university campus. The following are the conventional test to be carried out in establishing the water quality. The recorded data of different tests of waste water are described in the figures 1, 2 & 3 below.

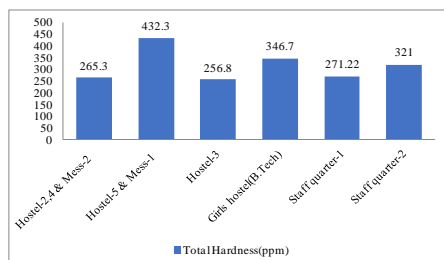


Fig 1: Hardness of water

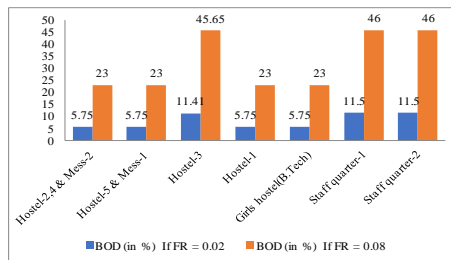


Fig 2: Biological Oxygen Demand

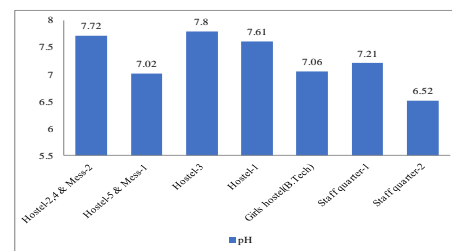


Fig 3: pH Process of waste water treatment

Policy on Self Sustainable campus:

Policy No- 1

Centurion University is committed to reducing its environmental impacts through effective waste management and aims to divert at least 90% of waste from landfill. The purpose of this policy is to enable the university to honour its commitment to manage waste responsibly.

Definitions:

Waste: Waste includes any substance or object which the holder discards or intends or is required to discard and any substance which constitutes a scrap material, an effluent or other unwanted surplus arising from the application of any process or any substance or article which requires to be disposed of which has been broken, worn out, contaminated or otherwise spoiled as per the Environmental Protection Act 1990 and amendments.

General waste: A form of controlled waste, comprising of all waste from the university the exception of fibre, co-mingled recyclables, food waste and hazardous waste.

Fibre waste: Card and paper

Co-mingled waste: Cans, Glass and Plastic. Note the absence of food as this will contaminate recyclables

Hazardous Waste: It includes waste that could, in certain circumstances, be harmful to human health or the environment in the short or long term due to its physical, chemical or biological properties. Batteries, fluorescent tubes, photographic chemicals, paint, waste oils, solvents, acids, alkaline solutions, pesticides and electrical equipment are all hazardous wastes.

Plan for Effective Management of waste

To manage waste responsibly, the university will:

- Remain compliant with all relevant waste legislation;
- Aim to reduce the amount of waste generated and the associated environmental impacts by applying the principles of the waste management hierarchy;
- Provide facilities to ensure the safe handling, effective segregation and secure storage of waste on all campuses, with these aimed at maximising reuse and recycling opportunities;
- Set specific objectives and targets in relation to minimizing waste, improving

recycling rates and reducing disposal to landfill;

- Complete regular waste audits in order to drive continual improvement;
- Provide appropriate training and induction for staff, students and visitors around waste practices and site specific requirements

Policy No- 2

Centurion University is committed to reducing its environmental impacts through effective waste management and aims to divert at least 90% of waste from landfill. The purpose of this policy is to enable the university to honour its commitment to manage waste responsibly.

Definitions:

Waste: Waste includes any substance or object which the holder discards or intends or is required to discard and any substance which constitutes a scrap material, an effluent or other unwanted surplus arising from the application of any process or any substance or article which requires to be disposed of which has been broken, worn out, contaminated or otherwise spoiled as per the Environmental Protection Act 1990 and amendments.

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Steps for effective waste management across the university

All staff, students, contractors and visitors have a personal responsibility to ensure the waste they create is dealt with in accordance with this policy. Chief consideration must be given to applying the waste management hierarchy to all activities across the university.

- Reduce: Only order/purchase/use the amount of materials required
- Reuse: Retain materials which can be reused onsite or by others
- Recycle: Segregate to maximise value of material for recycling
- Recover: Energy from waste will be recovered where facilities allow
- Dispose: Last resort
- Research: Centre for Waste to Wealth is dedicated to developing strategies to use waste and convert it to useful product. <http://research.cutm.ac.in/courses/center-for-waste-to-wealth-management/>



- Hazardous waste: The Biomedical Waste Bins are colour coded for managing the segregation of different Biomedical wastes into separate bins. CUTM collaborates with external organizations which are expert in handling hazardous waste. Non Government Organization "Sani Clean Private Limited" through an MoU for disposal of the wastes on a daily basis. The vendor from the company picks up the wastes from the colour coded bins and disposes it by duly adhering to the government regulations and guidelines applicable for Biomedical Waste Management Policy.

Programs on Aquatic Ecosystem and Water Resource management

A. Some of the important courses taught at Centurion University of Technology and Management related to the above-mentioned area are:

1. Water and soil quality management in aquaculture

Web Link: <http://courseware.cutm.ac.in/courses/water-and-soil-quality-manegement-in-aquaculture/>

2. Monitoring of water quality

Web Link: <http://courseware.cutm.ac.in/wp-content/uploads/2020/05/water-quality.pdf>

3. Soil and Water chemistry

Web Link: <http://courseware.cutm.ac.in/courses/soil-and-water-chemistry/>

4. Soil and Water Conservation through Watershed

Web Link: <http://courseware.cutm.ac.in/courses/soil-and-water-conservation-through-watershed/>

5. Aquatic Pollution

Web Link: <http://courseware.cutm.ac.in/courses/aquatic-pollution/>

6. Intensive Aquaculture

Web Link: <http://courseware.cutm.ac.in/courses/11961/>

B. Establishment of research center:

Center for Aquaculture and Fish Processing Technology

Focus areas

- Ornamental Aquaculture
- Biofloc Aquaculture
- Water Budgeting study
- Developing species specific feeds and health products for improved wellbeing of fishes
- Aquaponics
- Development of Value added fish product

Web Link: <http://research.cutm.ac.in/courses/center-for-aquaculture-and-fish-processing-technology/>

Biological control for aquatic weeds

The school encourages sustainable development without having any detrimental effect on the environment. For this noble cause Ramsagar reservoir was selected where the school planned for the development of this natural ecosystem.

Several species of alien flora and fauna has been reported from Ramsagar Reservoir. Plants like Water Hyacinth (*Eichhornia crassipes*), Gaint Salvinia (*Salvinia molesta*), and water cabbage/ lettuce (*Pistia stratioies*) caused severe damage to our wetland ecosystem.

The school had conducted a biodiversity study for Ramsagar reservoir and found that it is infested with *Eichhornia* aquatic weeds.

We are collecting the aquatic weeds on Bi-weekly basis and the fisherman are giving a positive response that now they can easily navigate into the pond with their boats and catch good quantities of fish for their livelihood. However when infestation is more, we also tried to stock Grass carp (*Ctenopharyngodon idella*). It is a valuable biological control for aquatic weeds. They can provide economical long-term protection from many weeds.



Initiatives taken by CUTM for Fish health surveillance:

Surveillance Programme is being done by School of Fisheries, Centurion University of Technology and Management at Nearby Ponds and Ramsagar reservoir to know the disease types of fishes throughout the year (2019-20).

Figure 1. Places of fish Surveillance Programme organized by Centurion University of Technology and Management

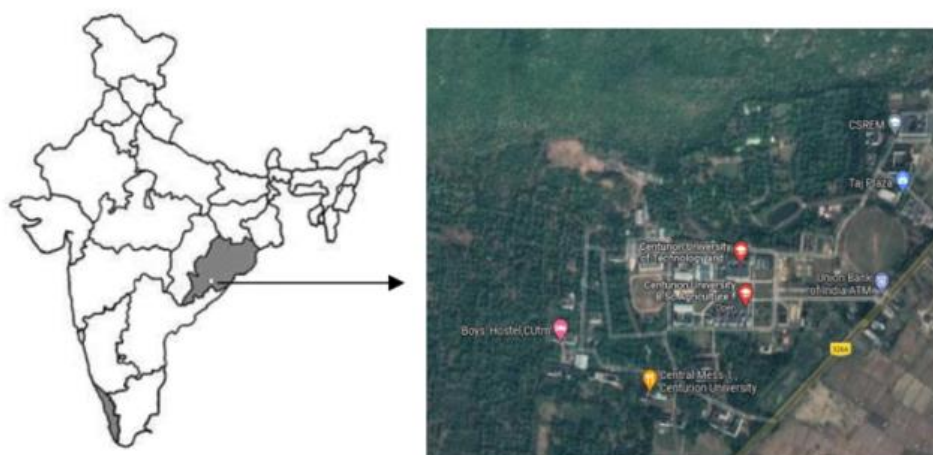


Table 1. Disease Surveillance report (2019-20). Web link: <http://research.cutm.ac.in/courses/center-for-aquaculture-and-fish-processing-technology/>

Monitoring of water quality

The physico-chemical parameters of water viz. temperature, pH, dissolved oxygen, free CO₂, NH₃, water hardness and alkalinity were monitored at fortnightly in order to check the health status of the aquatic system. The details of the study have been represented in tabular form. This study was undertaken from January 2018 and continues till date. The water quality parameter are analyzed by the students as a part of their curriculum.

Months of Sampling	Species affected	Bacterial Disease	Viral Disease	Parasitic Disease	Fungal Disease	Non-Infectious Disease
January	Rohu, Catla, Silver carp	Ulceration, Finrot & tail rot	No	No	No	No
February	Rohu, Catla, Silver carp	Ulceration, Finrot & tail rot	No	No	No	No
March	Nil	No	No	No	No	No
April	Nil	No	No	No	No	No
May	Nil	No	No	No	No	No
June	Rohu	No	No	White gill spot	No	No
July	Rohu	No	No	White gill spot	No	No
August	Rohu, Catla, Mrigal, Common Carp	No	No	Argulosis	No	No
September	Catla, Rohu	Ulceration	No	No	No	No
October	Catla, Rohu	Ulceration	No	No	No	No
November	Catla, Rohu	Ulceration	No	No	No	No
December	Catla, Rohu	Ulceration	No	No	No	No

Table 1. Physicochemical parameters of water for Ramsagar reservoir from January 2018 to September 2021

Water quality parameters	2018-2019	2019-2020	2020-2021 (Till September 2021)
Temperature (°C)	28.30 ± 0.72	29.66 ± 0.60	29.66 ± 1.45
pH	8.26 ± 0.51	8.4 ± 0.16	8.52 ± 0.35
Dissolved oxygen (mg ^l ⁻¹)	8.5 ± 0.45	8.48 ± 0.30	8.23 ± 0.27
Free Carbon dioxide (mg ^l ⁻¹)	0.68 ± 0.06	0.70 ± 0.024	0.63 ± 0.052
Total ammonia – N (mg ^l ⁻¹)	0.03 ± 0.001	0.03 ± 0.008	0.05 ± 0.001
Nitrite – N (mg ^l ⁻¹)	0.04 ± 0.001	0.05 ± 0.002	0.06 ± 0.003
Nitrate – N (mg ^l ⁻¹)	1.60 ± 0.17	1.56 ± 0.08	1.63 ± 0.08
Hardness (mg ^l ⁻¹)	64.62 ± 2.72	63.66 ± 2.02	65.33 ± 1.66
Alkalinity (mg ^l ⁻¹)	90.52 ± 3.85	83.21 ± 2.54	98.41 ± 1.50

Web link: <http://research.cutm.ac.in/courses/center-for-aquaculture-and-fish-processing-technology/>

Initiatives towards practising Good Aquatic Stewardship practices

The School of Fisheries, Centurion University of Technology and Management organized one day awareness programme on “**Responsible Use of Antibiotics in Aquaculture**”. The programme was intended to spread the awareness of the antibiotic resistance problem in fish farming and related sectors among the fish farmers. The programme was attended by the local fish farmers of the District.

Professors from the School of Fisheries explained the fish farmers regarding various antimicrobials available for the aquaculture and promoted their prudent use for the treatment of fish diseases. Antibiotics have been used mainly for therapeutic purposes and as prophylactic agents in aquaculture. They were also informed about the antibiotics in use, authorized or banned and other information of the reference. The sensible use of antibiotics to prevent the development of antibiotic resistance bacteria which is a serious threat to aquatic animals in terms of disease resistance that is beyond control. It can seriously impact productivity, is a human health hazard and also harmful to the environment. The potential consequences of antimicrobial resistance include reduced food production, reduced food

security, greater food safety concerns, higher economic losses to farm households, and contamination of the environment.

Professors from the School of Fisheries explained the consequences of antibiotic resistance and other drugs in aquaculture and public health. The farmers were also educated on various preventive and control techniques for fish infections and the usage of alternatives to lessen the indiscriminate use of antibiotics. The farmers were educated about the FDA approved drugs for usage in the aquaculture and drugs banned for aquaculture. The farmers were recommended to follow good aquaculture practices, use immunostimulants, prebiotics and probiotics, plant extracts with antimicrobial activity, antimicrobial peptides as alternatives to antibiotics. The programme ensured that the stakeholders realize the dangers of the drug resistance and its consequences to aquaculture and public health. The farmers were suggested to use drugs judiciously aimed at maximizing therapeutic efficacy while minimizing the selection of resistant microorganisms. Additionally, proper management of waste emanating from aquaculture farms and practices was recommended. This was followed by a question-answer session and feedback from the farmers.

Chemicals Usage for Aquaculture Health Management

The School of Fisheries, Centurion University of Technology and Management organized a awareness programme on **“Chemicals Usage for Aquaculture Health Management”**. The awareness programme was conducted for the local fish farmers of the District in Odisha. The programme aimed to raise awareness on the application, judicious use of chemicals, and management of water quality for the prevention, control and treatment of fish disease for sustainable aquaculture practices.

Mr. Zahoor Mushtaq, Assistant Professor, School of Fisheries discussed the importance of disease management in aquaculture and the ways to minimize risks associated with them as fish diseases can limit both the economic and socio-economic development of the countries. Stopping the spread of infectious pathogens in aquaculture facilities has been proven to be one of the greatest challenges for the expansion of sustainable aquaculture. Therefore, the farmers were recommended to monitor the health status of fish, identify and manage risks to fish health, and reduce exposure to or spread of pathogens for effective disease control within aquatic farming systems. The farmers were made aware of the importance of chemical usage and their role in the development of aquaculture. The emphasis was also laid on correct drug combinations, drug overuse, accurate diagnosis, timely treatment and the right stocking density in aquaculture for disease management purposes. Furthermore, information on different chemicals available in the market for the prevention and control of fish disease and strategies to improve water quality in culture facilities were given to the fish farmers.

Dr. Ngairangbam Sushila, Assistant Professor, School of Fisheries educated the fish farmers regarding the doses of different chemicals used in aquaculture. The fish farmers were also given the awareness on the cautious use of chemicals to avoid adverse effects such as environmental damage and the development of resistant strains. The farmers were educated about the FDA approved drugs for usage in the aquaculture and drugs banned for aquaculture. The farmers were recommended to follow good aquaculture practices, use immunostimulants, prebiotics and probiotics, plant extracts with antimicrobial activity, antimicrobial peptides as alternatives to antibiotics. The programme ensured that farmers know the importance of accurate diagnosis and timely treatment of fish diseases. The farmers were advised to use the chemicals judiciously and responsibly as they produce food for human

consumption. Additionally, the farmers were made aware of the good management practices for aquaculture systems to minimize chemical usage. This was followed by a question-answer session and feedback from the farmers.

Awareness program on shared aquatic ecosystems

Pond Health and Disease Surveillance of community lake

The School of Fisheries, Centurion University of Technology and Management, Odisha is primarily concerned with the general development of the fisherfolk via the engagement of its students for surrounding communities. Several projects have been implemented in collaboration with the communities in order to preserve communal water supplies and sources. Together with SHGs and local panchayat members, the students and faculties have conducted an awareness and working together program to uplift the fishermen communities. The details of the program are summarized below.

1. Weed clearing in the community lake

The students of SoF, CUTM were actively participated and helped the locals for clearing and cleaning of aquatic weed in and around the lake which usually affect the water quality and chock during fishing activities.

2. Water Quality Analysis

The soil and water samples were collected from the community lake by the students and the surrounding communities, and were then studied at the Aquaculture laboratory of the School of Fisheries. The lake's most crucial water quality parameters, such as dissolved oxygen, ammonia, pH, temperature, hardness, and alkalinity, used to be regularly sampled and studied.

3. Pond Management

The local fishermen do come to the school to get advice from the faculties about any issues that could arise in their pond while they are growing their fish. The management strategies that were suggested were based on reports of the soil and water quality parameters. The suggestions given to the fisherfolk were like stop dumping waste into the community lake, don't wash utensils used for application of insecticide/pesticide in agriculture field, stop introducing invasive fish species and chemicals or drugs.

4. Disease Surveillance

Students of School of Fisheries collected fish, water and soil samples from the community lake and brought to the laboratory for the pathological analysis. Different bacterial communities were observed but were under the acceptable level. Further the technical team during the program suggested fisherfolk and surrounding communities to stop releasing waste into the lake and save life for the coming generations.

Fish Breeding Programs for Fisher Folk –

The School of Fisheries of Centurion University of Technology and Management involves itself in the seed production of mostly cultured, consumed and domesticated indigenous and exotic fish species. Fish Breeding Program for Fisherfolk was conducted for providing training and demonstration to the fish farmers. The aim of the program was to promote seed production activities and availability of quality seeds for getting higher production. Further for the upliftment of the economic status by securing higher production in small area (backyard) through ornamental fish farming. The fish farmers from local areas were enthusiastically participated in the program. The following activities were performed during the program.

1. Breeding of Indian Major Carps (IMC) and Exotic Major Carps (EMC)

Carp brooders were collected from the wild and brought to the Fish Rearing Centre of School of Fisheries, CUTM. The brooders were acclimatized and observed for maturity. During the demonstration program, the brooders were induced with gonadotropic hormone and shifted to spawning pool, a component of Circular carp hatchery, along with fisherfolk. The brooders responded during early morning and then the eggs were shifted to hatching pool. The spawns were observed by fisherfolk on the next day followed by nursery rearing system. The same program for another carp species also followed and demonstrated to the fisherfolk along with the students.

2. Breeding of Commercially Important Ornamental Fishes

Commercially important ornamental fish brooders were procured from the ornamental fish market, Kolkata and acclimatized in Ornamental Fish Laboratory, SoF, CUTM. The setup and identification characters for the species were explained and demonstrated to the fisherfolk along with students. The breeding of most domestically conserved ornamental fish, Gold fish, was performed and demonstrated to fisherfolk. During demonstration, information about different other ornamental fish species like Angel fish, Gourami's, Live Bearers and Cichlids were also focused.

Rasur Lake Ranching Program

The Rasur lake is seasonal and during the summer the lake become dry. For providing fish as food for the fisherfolk introduction of new fish stock (ranching) is important. The school of Fisheries along with its students conducted a program of Rasur Lake Ranching. The details are explained as follow

1. Ranching of Indian Major carps

The most widely available and consumed food fish of India was introduced by School of fisheries, CUTM to Rasur Lake during the program along with the fisherfolk. The species introduced were *Catlacatla*, *Labeorohita* and *Cirrhinusmrigala*. All the community peoples were enthusiastically participated in the program and offered gratitude for the ranching.

2. Ranching of Exotic Major carps

The fast growing, biologically sustainable and consumed food fish introduced to India was released by School of fisheries, CUTM to Rasur Lake during the program along with the fisherfolk. The species introduced were *Hypophthalmichthies molitrix*, *Ctenopharyngodon Idella* and *Cyprinus carpio*. Everyone in the neighborhoods participated in the program with enthusiasm and expressed their thanks for the ranching.

CUTM's Strategy for a Self- Sustainable Watershed management

Watershed management strategies, implemented in the campus area of the CUTM Paralkhemundi, are playing significant role in maintaining the sustainability of the aquatic ecosystem of the campus. There are five percolation tanks of different dimensions are present in the campus aiming to collect runoff water generated within the area of campus. A loose boulder check dam was constructed at the vicinity of the campus to check the velocity of runoff generated from the slope of the mountain situated near the campus. For the roof water management, facility created to collect all the discharge of roof water from interconnected lined channel and stored in ponds for reusable purpose.

Percolation tanks

The annual average rainfall of the area is around 1700 mm and 80 percent of rain occurred during the monsoon (June to September). The runoff generated due to the rainfall may flow away from the campus and may erode the soil during the flow. Therefore the percolation tanks are constructed to collect the surface runoff water and recharge the groundwater artificially. Percolation tanks may augment the quantity and improve the quality of groundwater.

There were five percolation tanks situated inside the campus to collect the runoff generated from surface area, roads, adjacently situated mountain, experimental crop fields and roof water of all the buildings situated inside the campus. The dimensions and capacity of each percolation tanks are mentioned in the table.

It is about 6900 cubic meter of water may be stored and about 4000 cubic meter of water may be recharged and contributed to groundwater storage from all the five percolation tanks. Along with this lateral flow of stored water may provide required quantity of water to the surrounding plants. Fish farming also can be done in these stored structures.

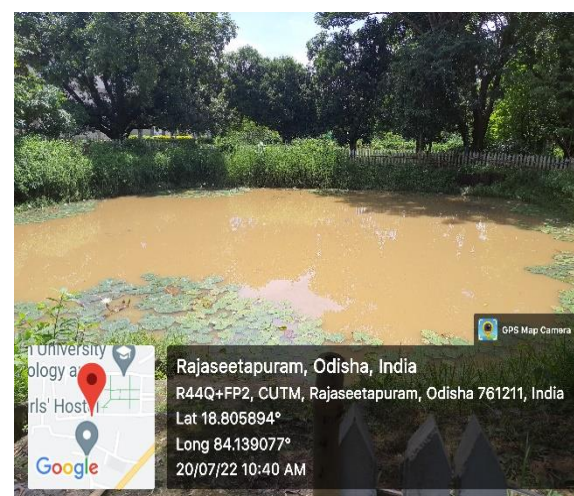
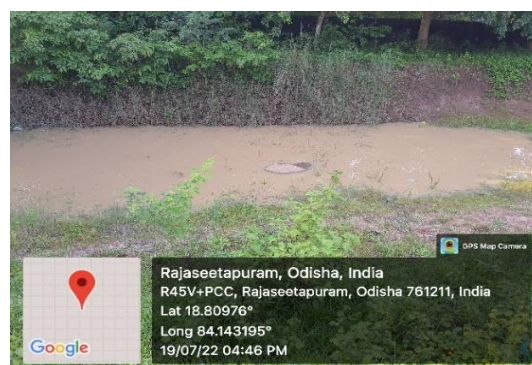


Table: Dimensions and capacity of percolation tanks

Sl. No.	Length, m	Width, m	Depth, m	Capacity of the tank, m ³
1	30.5	18.3	3.0	1699.0
2	18.3	18.3	3.0	1019.4
3	15.2	18.3	3.0	849.5
4	30.5	18.3	3.0	1699.0
5	30.5	18.3	3.0	1699.0
Total				6965.0

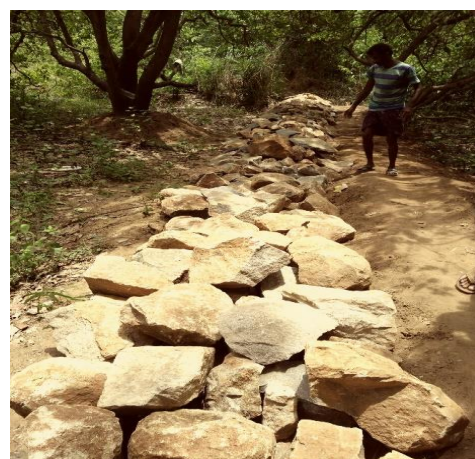


Watershed management strategy

To maintain the sustainability of the aquatic ecosystem in the campus, CUTM Paralkhemundi, implemented some of watershed management measures to conserve the soil, store the water and recharge the groundwater. A loose boulder check dam was constructed at the vicinity of the campus to check the velocity of runoff generated from the slope of the mountain situated near the campus. A pond was constructed and lined with LLDPE polyethylene and currently using for fish rearing purpose.

Loose boulder check dam

Huge amount of runoff was generated from the mountain situated near the campus and it was entering in the campus premises. Due to the enormous amount of runoff few hazardous such as soil erosion from the experimental fields, damage of campus roads, water logging in crop field and land sliding may occur during the monsoon period. Therefore, Check dams having made up of boulders were constructed at vicinity of the campus wall. Check dams generally constructed to reduce the runoff water velocity and diverted it to percolation and/or storage tanks. Multiple check dams were constructed along the slope of mountain. The dimension of check dams are 10 m length, 2 m wide and 2 m height. These structures reduces the slope length and provide more opportunity for runoff water to percolate into the soil and get recharged.



Storage pond

Storage ponds are tanks or pools designed with surplus storage capacity to collect surface runoff during monsoon period and create facility to use it for the lean rainfall months. They consist of a permanent pond area with dugout land and embankment constructed in surroundings to provide additional storage capacity during rainfall events. The lining of pond may reduce the percolation loss by 60% and improve the water availability for longer period of time. Pond liner is an opaque materials for liquid to retain water from percolation. The storage pond was constructed with the dimension of (L:W:D 120:60:15) and having the capacity of 3000 m³ of water for reusable purpose in the campus of CUTM Paralkhemundi. The pond was lined with 500 micron thickness of black colored LLDPE polyfilm. The surface runoff water generated within the campus and runoff flow from the mountain near the campus were collected in the pond. The roof water from campus buildings were conveyed with the lined channels and stored in the storage pond. The stored water may be used for various purposes such as irrigation for experimental fields and for cattle feed. The stored water also can be used for rearing and breeding of fish. Some of the commonly cultivated carp varieties such as catla (*Catla catla*), rohu (*Labeo rohita*) and mrigal (*Cirrhinus cirrhosis*) are cultivated in the storage ponds.



