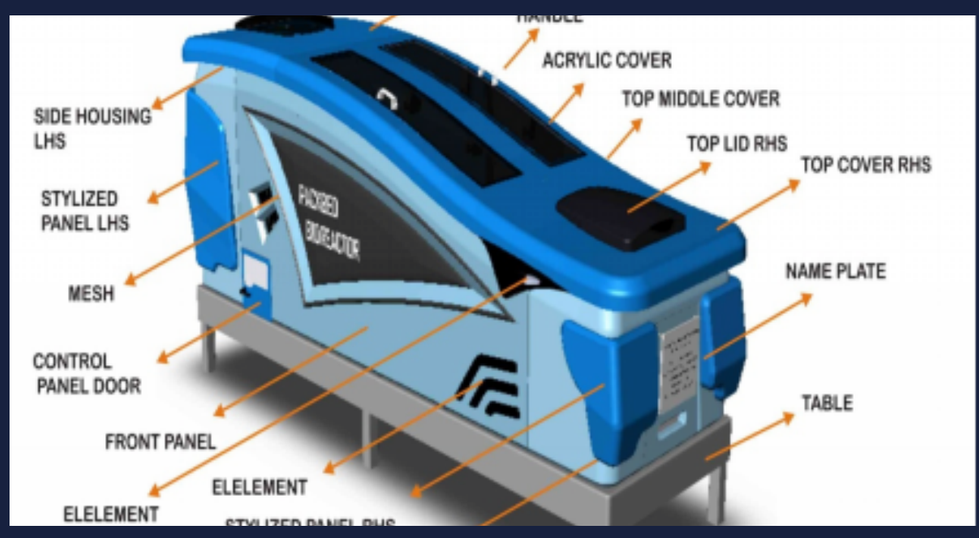
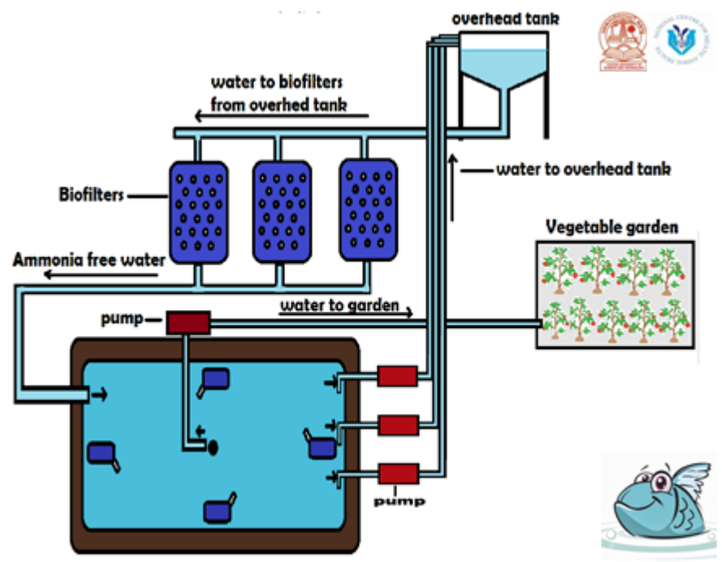
COCHIN UNIVERSITY OF SCIENCE AND TECHNOLOGY

SDG 14. Life Below water

14.5.MAINTAINING LOCAL ECOSYSTEM

14.5.5 WATERSHED MANAGEMENT STRATEGY





14.5.5 WATERSHED MANAGEMENT STRATEGY

1. LAUNCHED RECIRCULATING AQUACULTURE SYSTEMS (RAS) FOR HIGH DENSITY FISH CULTURE AND RECIRCULATING AQUACULTURE SYSTEM MODE INTEGRATED WITH VEGETABLE CULTIVATION

A capacity-building initiative in Recirculating Aquaculture Systems (RAS) has already been launched to strengthen skills and knowledge in sustainable aquaculture practices. RAS technology, which enables efficient fish farming by continuously recycling water, offers a solution for high-density aquaculture with minimal environmental impact. This program is designed to equip aquaculture professionals, researchers, and students with technical expertise in RAS design, operation, and maintenance, covering critical aspects such as water quality management, biosecurity, and waste reduction. By promoting RAS, the initiative contributes to reducing pressure on natural water bodies, conserving water resources, and ensuring that aquaculture can meet growing food demands sustainably. This training empowers participants to drive innovation in aquaculture, aligning with broader environmental and food security goals. This Technology has three major components, pond designed having dimensions 67m length 6.7m width ×2m depth to accommodate 90m3 water and the bottom made conical with 18 slope and a central pit of 30cm diameter and 30cm height to facilitates easy and steady accumulation of detritus (slurry)easily removable with a slurry pump, mechanism of circulation of water combined with heavy aeration through air injector operated with a 0.5hp centrifugal pump creating swirling motion and concentration of the slurry at the central pit. Nitrification and denitrification are effected by specially designed three trickling filters activated prior to installation using nitrifying bacterial consortium having in it denitrifyning bacterial components as well. The system is exposed to sunlight to facilitate micro-algal growth generating much of the oxygen needed during day time. Fishes are stocked in three cages having 30m3 water columns and each to hold a minimum of 1500 fishes to grow from 1 gram to 300 grams with in a period of 4 months to facilitate regular stocking and continuous harvest and sale and to have three crops in an year. An emergency aeration system is provided to facilitate nonstop aeration during power failure. The system can be operated by homemakers and a mini water testing laboratory established facilitates regular monitoring of the water chemistry with adequate correction.

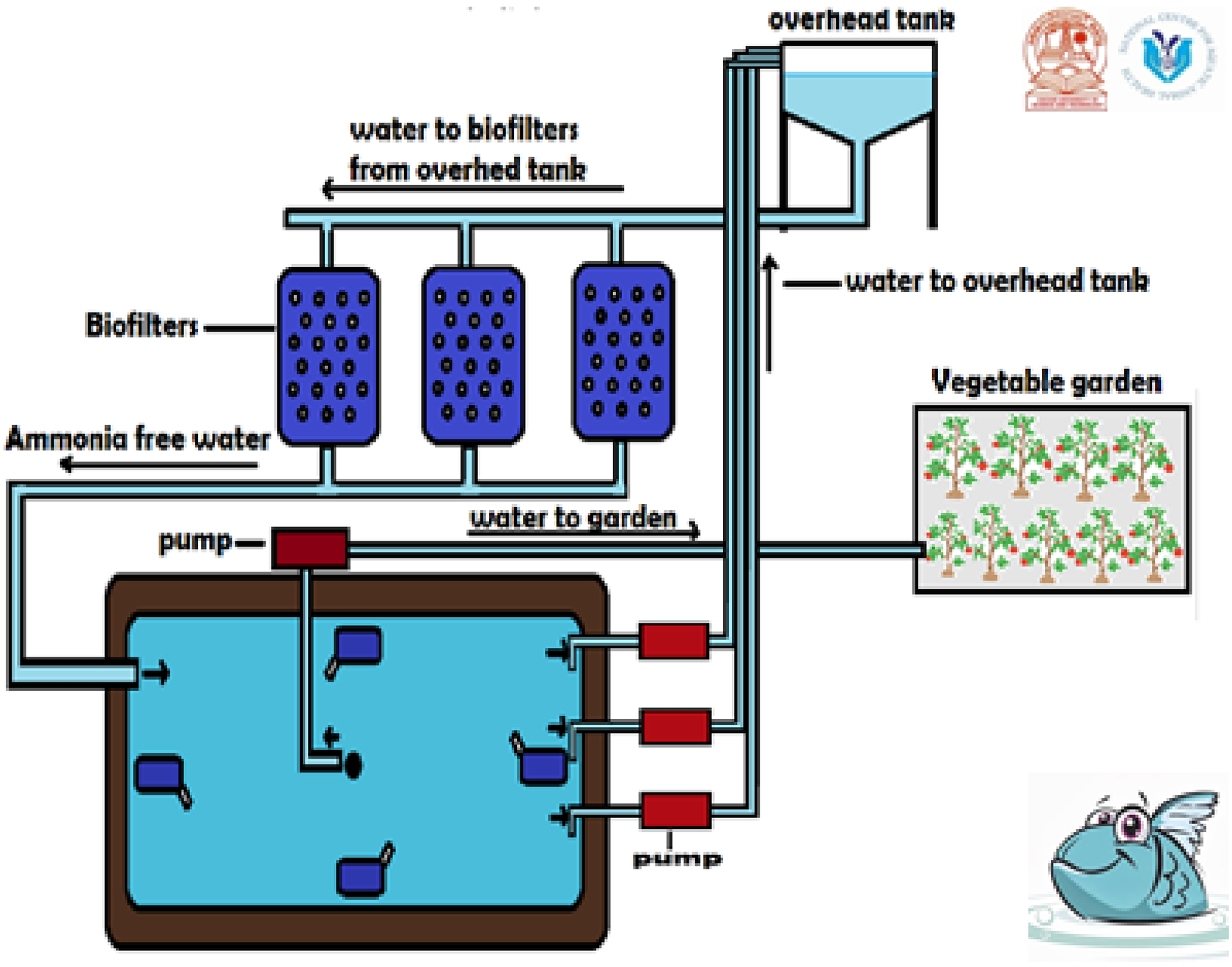


Fig. 14.5.17 Demo of working principle of Recirculating Aquaculture Systems (RAS) at NCAAH, CUSAT

Fig. 14.5.18. Recirculating Aquaculture Systems (RAS) installed by NCAAH, CUSAT

2. BROODSTOCK MAINTENANCE AND SEED PRODUCTION

Nitrifying Bioreactors (Stringed Bed Suspended Bioreactor (SBSBR and Packed Bed Bioreactor (PBBR)) Th The reactor will continuously oxidize ammonia to nitrite and nitrate. Nitrifying bioreactor technology for integrating to Recirculating Aquaculture Systems - The Technology has been licensed for commercialization through M/s Oriental Aquamarine Biotech. India Private limited.The company has been empaneled by National Fisheries Development Board, Hyderabad as the company to supply devices for RAS.

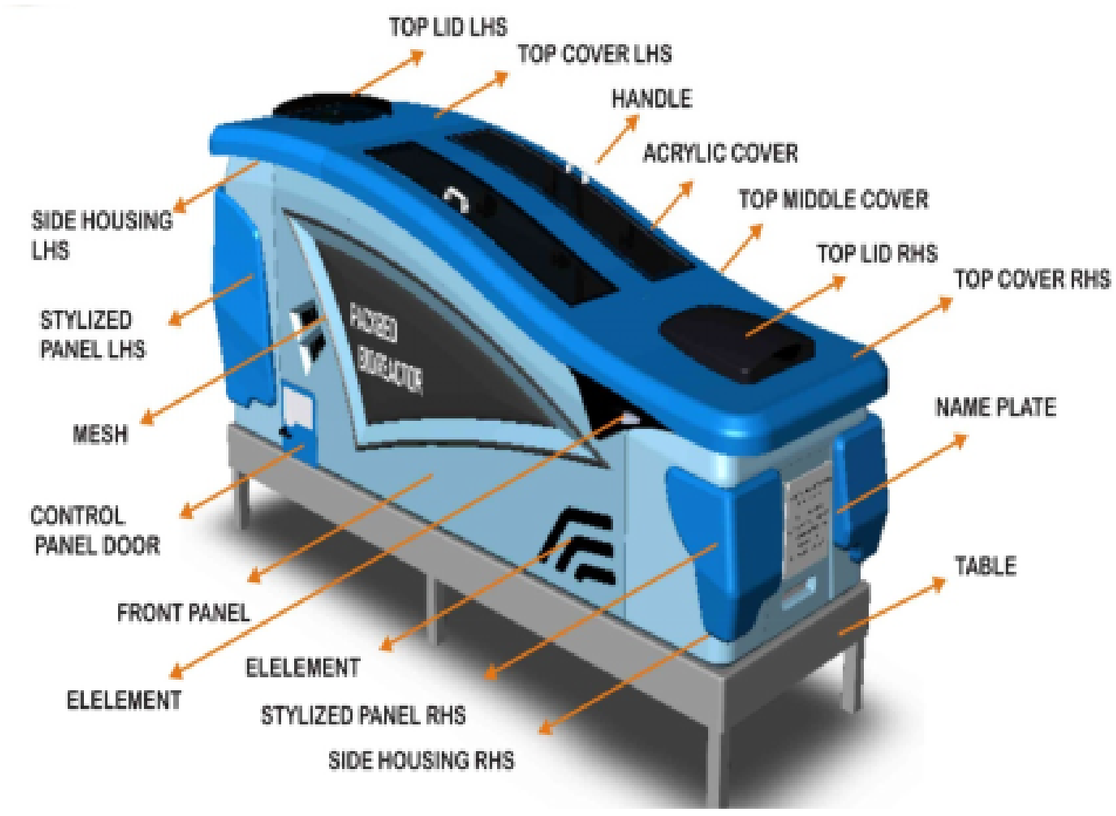
A.PBBR is meant for establishing Recirculating Aquaculture Systems (RAS) in which it oxidizes ammonia to nitrate and reduce it to elemental nitrogen there by total removal of nitrogenous waste is accomplished. The reactor is with cartridges on which the nitrifiers are immobilized. The nitrifying bacterial consortia used for activating the reactors do have the capability to degrade dissolved organic matter thereby bringing down organic loading in the rearing system. The PBBR in the present configuration has the capability to handle 30 litres water per minute which can be scaled up as per requirement.

B. SBSBR is meant for smaller culture systems (50 to 500 litre) used for maintenance of brood stock for shorter period and in larval rearing systems where live feed is used. The live feed on entering in to the reactor comes out un-mutilated. The reactor is supplied activated and the user can deploy in the culture system and establish nitrification and denitrification instantaneously

C. Trickling nitrifying bioreactor – Specially designed for backyard RAS having the specialty of energy conservation as the water from the over head tank flows down and subjected for nitrification with the passive air flow (Patent pending).

D. Submerged fluidized bed nitrifying bioreactor – specially designed for RAS in which both aeration and nitrification have to be accomplished simultaneously (Patent pending).

E. High Performance Turbulence Fluidized Bed nitrifying bioreactor is newly designed high-performance reactor, originally designed for aquaculture which can find application in effluent treatment in fish processing industries. It has effective column height of 120cm and bottom conical portion of 25cm. Polystyrene/polypropylene beads are used as attachment sites for bacteria maintained fluidized with up and down word flow of the effluent. The influent is taken in to the system by top loading, passes through the fluidized bed and gets discharges through the out let pipe positioned 150 cms from the bottom. Venturi aeration system shall create turbulence and provide aeration. The flow rate can be regulated by having an overhead tank (Patent pending).



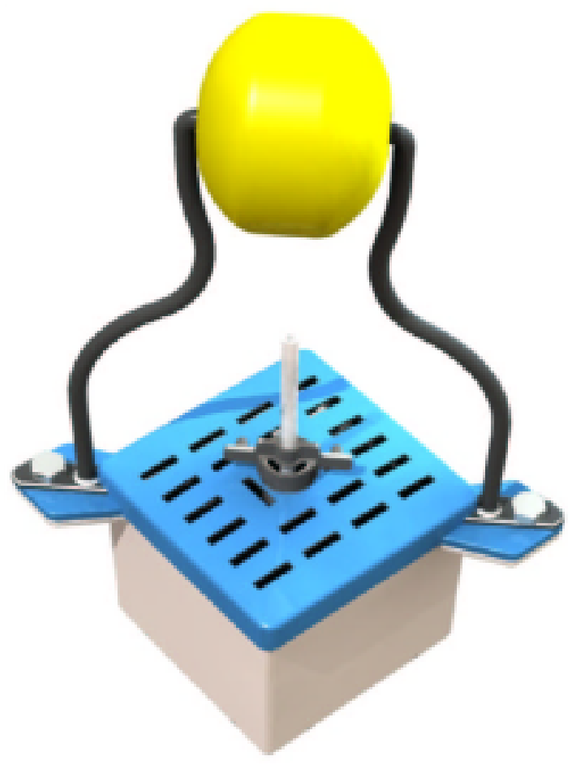


Fig. 14.5.18. Research tools and establishments on broodstock maintenance and seed production at NCAAH, CUSAT

Fig. 14.5.19. Broodstock maintenance and seed production unit at NCAAH, CUSAT

3. WATER HARVESTING PRACTICES AND OTHER WATERSHED RELATED INITIATIVES IN CUSAT

The following are the important water harvesting practices in CUSAT which eventually helps in Watershed management and helps in developing strategies.

- Rain water Harvesting
- Borewell/Open well Recharge
- Construction of Tanks and Bunds
- Waste water recycling
- Maintenance of waterbodies and distribution system in campus

The water discharge and treatments are planned in such a way that it can no way be harmed on any diversity of aquatic species.

Fig. 14.5.20. Water treatment plant at CUSAT

Fig. 14.5.21. Waste water recycling plant at CUSAT

Fig. 14.5.22. Maintenance of waterbodies and distribution system at CUSAT campus

Fig. 14.5.23. Constructed Tanks and Bunds for water conservation at CUSAT

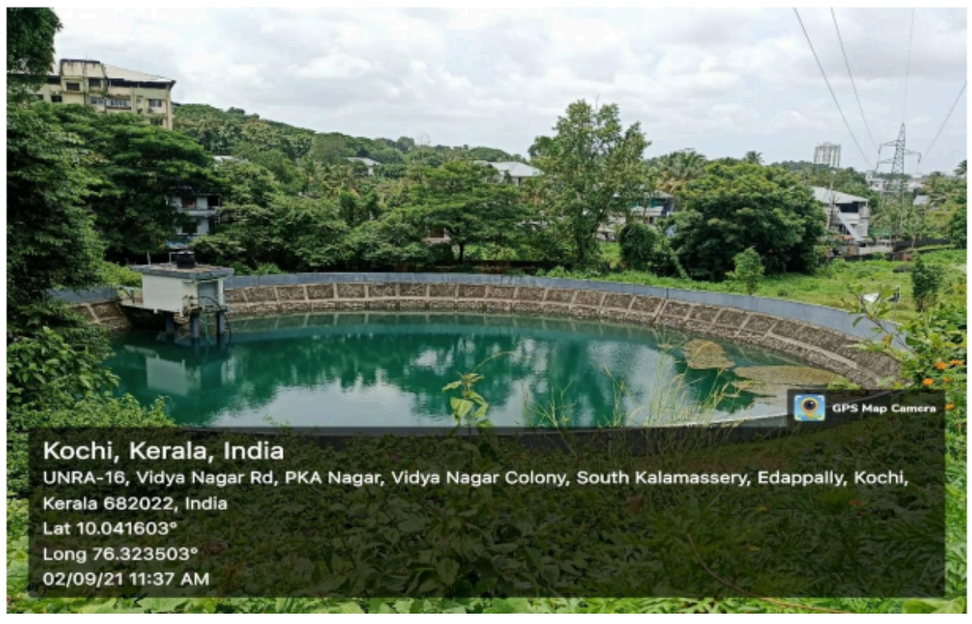


Fig. 14.5.24. Rainwater Harvesting at CUSAT

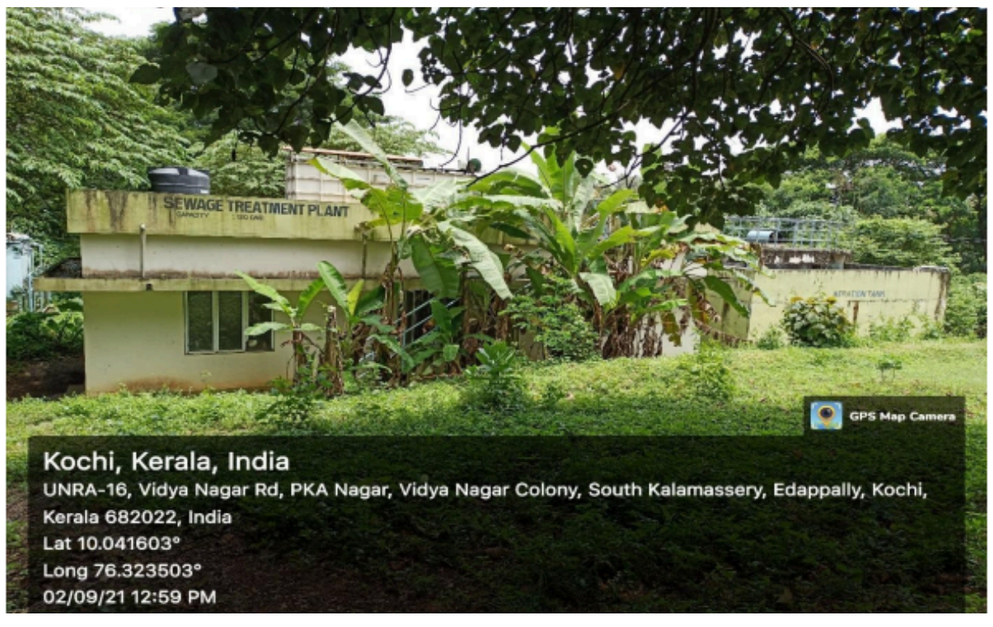


Fig. 14.5.25. Sewage treatement plant at CUSAT