

- Live fish transportation
- Advanced biotechnological methods for early detection of fish diseases
- Reorganisation of the existing cadre strength based on prioritisation
- Need to equip CIFT's laboratories with modern testing facilities to the levels available in the laboratories of EU and USA, to meet the world standards in the context of the WTO regime
- Provide adequate exposure to scientists especially in Biotechnology and Bio-informatics by deputing them to reputed Scientific institutions abroad

6. SCENARIO & SWOT ANALYSIS

6.1 Strengths

- Excellent facilities for research and training in harvest and post harvest technology in fisheries. Asian, African and European countries and agencies like FAO, NACA, EU, UNDP sponsor candidates for training at CIFT.
- Highly competent and trained R&D staff.
- The only multi-disciplinary research institute in the country with the capability of dealing with the entire range of harvest and post harvest technology of fish.
- Research Centres at key points to cater to the region specific needs in both marine and inland fisheries.
- An excellent library with a total number of 9633 books, 73 journals/periodicals, 13 databases and 195 CDs and videos to cater to the needs of the scientists, research scholars and students.
- A research fleet of six vessels ranging from 9.1 to 17.5 m LOA for inland, coastal and offshore operations.
- Sophisticated equipment for materials testing, evaluation of corrosion resistance, analytical instrumentation and for pollution investigations.
- Steps for the acquisition of a new fully equipped multi-purpose 17.7 m LOA fishing vessel been initiated.
- Pilot plant facilities for processing and production of fishery products, an animal house for nutritional studies, engineering workshop and stand-by power.
- Given the stature of a National Referral Lab in fishery technology by the NATP of the ICAR.
- An Agricultural Research Information System (ARIS) equipped with a local area network system with a connectivity of fifty computers and standalone PCs to support database management and analytical needs. It has connection with the National Informatics Centre Network to provide satellite based communication and net working.
- Identified for manning the Supervisory Audit Team (SAT) and is represented in the Inter Departmental Panel (IDP) of Export Inspection Council of India for approving and monitoring fish processing units exporting to European Union.
- Conducts regular Masters and Doctoral programmes in Post Harvest Technology under ICAR.

- Has the expertise to transfer viable technologies to entrepreneurs through consultancy services and training programmes both at national and international levels.
- In collaboration with Space Application Centre, Ahmedabad locates potential fishing zones and transmits the information to the fishermen at the same time helping the SAC in validation of their data.
- An Agricultural Technology Information Centre (ATIC) to disseminate knowledge in new technologies developed and to popularise new products.
- CIFT has the necessary technical capability to design, develop and construct prototypes of new generation fishing vessels for commercial operation
- The Institute has developed and popularised many responsible fishing gears and accessories like square mesh codends, V form steel otter boards and also Turtle Excluder Device (TED) for conservation of the endangered marine turtles.
- Island territories like Andamans and Lakshadweep are using the consultancy services of CIFT for exploiting and utilizing their fishery resources, especially tuna.
- Technology transfer programmes in the north-eastern hill (NEH) region have been initiated and several training programmes organised for development of fisheries in the region.
- CIFT has developed expertise in conversion of fish processing wastes into useful by-products.
- The institute has been instrumental in laying down appropriate standards for fish and fish products and formulating quality criteria like SSOP, GMP, GLP and HACCP for fish processing plants. It is recognised as a referral laboratory in fisheries technology.
- Facilities and expertise are available for advanced research in fish processing and packaging.
- Has established and is maintaining a national collection of micro organisms of importance from aquatic sources.
- The institute can offer training in Polymerase Chain Reaction (PCR) technique for detection of viral diseases in farmed shrimp. Sophisticated equipment including LC MS-MS for detection of antibiotic and other residues at ppb levels in seafood is also available.
- Maintains linkages with international agencies like FAO, ICLARM, NACA, SEAFDEC, ODA (UK), NORAD and also fisheries universities in the far east and Japan.
- Approved national institute for testing fishery products for exports and recognised by EC and FDA. It also serves as a national agency for standardisation of fishing gear and processed fishery products.

6.2 Weaknesses

- The only Research Centre for work on inland, riverine and reservoir fisheries is closed down. This is an area to be strengthened for which suitable arrangements are to be made
- Shortage of manpower due to retirement of large number of experienced scientist and staff on superannuation is one of the main weaknesses. Lack of sufficient scientific and technical manpower makes it difficult for the institute to keep pace with the latest international development in fisheries research. Strengthening of divisions at various levels needs to be addressed as a top priority. The cadre strength also needs urgent revision.

- The Institute is housed in 3.93 acres of land only which is totally inadequate for a national institute. For future developments more land is to be acquired which is right now available contiguous to the campus from the Cochin Port Trust.
- CIFT is built on land leased from the Cochin Port Trust (Ministry of Surface Transport), which regularly hikes the lease amount enormously. An early decision by ICAR is needed to purchase or permanently acquire the leased land and additional area from the Port Trust. Lease charges swallow up all allocation under 'Contingencies' and 'Other charges' (Non-plan). **THIS IS AN URGENT PRIORITY.**
- There are at present no berthing facilities for fishing craft. CIFT is now dependent on other organizations for this facility.
- There is no testing tank facility for fishing gear development and testing. Use of facilities at IIT, Madras is inconvenient and involves long delays. Expertise and facilities in this area is essential for CIFT's work.
- CIFT does not have remote operated underwater vehicle (ROV) and low-light level underwater television camera for research on fish behaviour which is essential for innovations in fishing gear research.
- New academic programmes should be introduced in harvest technology.
- The inland Research Centre of the Institute at Hoshangabad has been closed down and the fate of the Burla Centre is uncertain.
- The Research centres have to be strengthened with adequate number of scientific and other personnel, providing infrastructural facilities and adequate budget.
- Staff at all Research Centres have to be provided with amenities like residential quarters.

6.3 Opportunities

- CIFT has the potential to become an International centre of excellence, offering academic programmes, training facilities and consultancy service to tropical Asian countries.
- The importance of fisheries in the national economy is increasing and CIFT can play a very vital role in this field.
- There will be increasing demand from the industry for testing fish and fish products as our exports increase and also CIFT can develop the code of practices for packaging. This is an area where very few institutions have built up facilities and expertise. CIFT team can be a leader in this area.
- Scope for designing fishing craft and gear for sustainable fisheries. If suitably strengthened, this facility can help in bringing out better designs of fishing vessels and gears.
- Elevated to national agency for testing water and food for safety according to international standards.
- A strong domestic market for processed fishery products, ready to eat fishery products etc. is emerging fast. CIFT can play a vital role in bringing about this much needed change of value addition and diversification.
- Deep sea and distant water fishing will mean special problems of onboard handling, preservation, packaging, quality control, transport and product development which will need more R&D attention.

- CIFT can play a significant role in the all round development of inland fisheries including processing and marketing.
- R&D for development of new by-products and for waste utilisation will be needed in the years ahead which can be provided by CIFT only.
- CIFT is certain to be called upon to play a greater role in quality assurance, pollution control in water bodies and environmental protection. The popularity of food safety in overseas and domestic markets has opened up a lot of opportunities for development of package of practices for food safety, rapid methods for defect/hazard monitoring, efficient process for waste reduction and treatment of effluents.
- Opportunities for development of novel products with therapeutic, nutritional and industrial importance from aquatic sources have to be exploited.
- CIFT has to gear itself to function as a pivotal consultancy agency in implementing the Environmental Impact Assessment (EIA) when this becomes mandatory in future projects.

6.4 Threats

- Establishment of a large number of private test houses with overseas accreditation is a threat to resource mobilisation. CIFT should be elevated to international level with statutory powers and additional legal and institutional support.
- Recruitment of CIFT staff has been inadequate and patchy, and unless young blood is quickly put in place and a good second line of command established, all past achievements will be nullified.
- Non sustainable growth of the fisheries sector and environmental degradation may threaten fishery resources and future development of the institute.
- Failure to implement scientific management measures to control open access to capture fisheries may lead to fishery collapses and inter sectoral conflicts.
- Disabling policies, changing political priorities, negative public opinion, market forces and budgetary constraints could affect development and opportunities.

7. PERSPECTIVE

- By Year 2025 CIFT will emerge as a leading institute of international repute to serve the country in solving problems relating to fisheries technology in the marine, inland and culture sectors.
- Fishing accounts for the major part of diesel consumed in the country. Popularisation of designs of fuel efficient fishing vessels will lead to substantial saving in fuel.
- Responsible fishing methods and gear will lead to conservation of fast depleting fishery resources by ensuring escapement of juveniles and by catch reduction, thereby reducing post harvest losses also.
- Developing designs for fuel efficient fishing crafts and conservational fishing gear for eco-friendly and responsible fishing.
- Diversification and value addition in fish processing will reduce the over dependence of the industry on shrimp and will give a new impetus to the marine products processing industry.

- Designs of efficient effluent treatment plants for fish processing factories will save substantial quantities of potable water by recycling of treated water and this will ease the pressure on drinking water resources in cities
- Introduction of improved small motorized and mechanised fishing craft will improve the lot of traditional fishermen.
- Ready to eat products from fresh water fishes will help in their commercial utilization ensuring better returns to aqua farmers.
- Strict monitoring of food safety aspects when effectively implemented will improve hygienic conditions in landing centres and retail markets, reducing food borne diseases.
- Isolation of bioactive and industrially important compounds from aquatic resources will make life saving drugs available to the common man at affordable prices.
- Value added products from low value fishes will make high quality fish protein available to the common man and will develop a good internal market for fishery products.

7.1 Scientific Programmes Proposed

- Continued evaluation of materials for fishing vessel construction
- Preservative treated rubber wood and coconut wood for small craft construction
- Continued evaluation of materials for fishing gear fabrication
- Corrosion protection and prevention of biodeterioration
- Development of cost-effective, innovative, responsible fishing techniques for inland and marine coastal and deep-sea fisheries of east and west coast of India
- Continued optimization of fishing gears for aquaculture and inland resource systems viz. rivers, estuaries and reservoirs, and marine resource systems in Indian Exclusive Economic Zone and beyond
- Cost reduction in fish harvesting
- Selective fishing gear and practices for coastal and deep sea ecosystem
- Selective fishing gear and practices for rivers and reservoirs
- Fish cages for inland, coastal and offshore regions
- Optimised craft-gear combination for sustainable harvesting of small medium and large reservoirs
- Fish aggregating devices for inland water bodies
- Fish aggregating devices for coastal and offshore regions
- Development of by-catch reduction devices
- Application of Satellite Remote Sensing and GIS in fisheries
- Region specific development of fishing craft and gear for NEH region
- Fisheries Acoustics
- Fisheries Electronics

- Scientific inputs for evolution of fisheries legislation for management of Indian fishery resources
- Evaluation of traditional fishing systems and improvement in terms of efficiency energy consumption and ecological impacts
- Post-graduate academic programme in Fishing Technology
- Processing and preservation of value added products such as ready to cook and battered and breaded products etc from farmed and fresh water fish
- Handling, preservation and product development for cold water fishes mainly rainbow trout
- Long distance transportation of marine and inland fish with emphasis on live fish and shellfish transportation
- Development of need based, region specific fish processing technologies
- Development of database on fishing and fish processing parameters for different regions
- Identification of appropriate packaging materials for fish and products for domestic and overseas markets
- Complete utilization of fish with emphasis on environmental protection
- Development of products of high protein content for community health programmes from farmed fish and by-catch
- Rapid estimation methods for biochemical and quality control parameters
- Improvement of traditional smoking and curing techniques suitable for different regions including the NEH
- Utilisation of fish wastes for livestock feed and preparation of biodegradable films
- Formulation of package of practices for achieving HACCP, SSOP, GMP and GLP in farming and processing of fish and shellfish
- Evaluation of quality in the domestic fish trade chain to identify defects and hazards in the system and to formulate remedial measures
- Development of efficient effluent treatment procedures for fish farms and fish processing industries
- Development of standards for novel and value added products
- Preparation of appropriate GIS of groundwater and fish in relation to typical hazards
- Production of nutraceuticals like high protein flours, hydrolysates, calcium and phosphorus supplements and extruded products from low value fishes
- Isolation, characterization and utilization of pharmacologically important bioactive substances and industrially important enzymes from aquatic sources
- Studies on toxic residues in fish and fishery products
- Monitoring nutrients, pollutants and toxicants in the context of food safety, nutrition labelling and nutritional security
- Studies on the biochemical and immunological aspects of fish diseases

- ➔ Surveillance and management of diseases, both bacterial and viral, in aquaculture farms
- ➔ Microbial hazard and risk analysis in seafood on a national scale
- ➔ Refinement in the detection methods for antibiotic residues and bacterial inhibitors in farmed and processed seafood and aquatic environments
- ➔ Bio-security of farm environments and farmed products
- ➔ Bio remediation for environmental management and development of scavenging microbial consortiums
- ➔ Molecular mapping of aquatic microbes as a tool to prevent drain of our genomic wealth
- ➔ Development and maintenance of National Collection of Aquatic Fish Bacteria (NCAFB) with supporting genomic database to meet the world trade regime
- ➔ Development of processing machinery for marine, fresh water and farmed fish products
- ➔ Development of cryogenic engineering technology for fish processing
- ➔ Development of new generation, fuel efficient fishing vessel designs for marine, riverine and reservoir water bodies
- ➔ Modernisation of propulsion system and deck equipment for the fishing fleet
- ➔ Development of instruments for fish harvesting, fish processing and quality control
- ➔ Estimation and sampling studies in fishing and fish processing industries
- ➔ Statistical quality control related to fishery products
- ➔ Techno-economic evaluation of technologies developed
- ➔ Evaluation of the production and marketing of fish and fishery products
- ➔ Popularisation of responsible fishing methods, fish disease prevention practices and methods for reduction of harvest and post harvest losses
- ➔ Transfer of technologies for production of value added fish products and by-products
- ➔ HRD in small scale fisheries sector through awareness and training programmes, hygiene and sanitation, development of fish business at micro-level and development of cadre of para-extension workers in fisheries
- ➔ Strengthening of linkages with public and private organisations, NGOs, State and Central Government organisations, Universities etc.
- ➔ Research programmes in priority areas like coastal zone management, adoption of innovation in capture and culture fisheries including sanitary and phyto-sanitary measures, impact of globalization and e-extension

7.2 Basic, Adaptive and Anticipatory Research

Basic Research

- Acoustic identification of fishery resources
- Environmental impact assessment of different fishing gear
- Rapid estimation methods for biochemical and quality control parameters
- Isolation, characterization and utilization of pharmacologically important bioactive substances and industrially important enzymes from aquatic sources

- Investigations on structure and sequencing of biomolecules
- Identification of toxic residues in fish and fishery products
- Quality improvement by depuration studies
- Monitoring nutrients, pollutants and toxicants in the context of food safety, nutrition labelling and nutritional security
- Biochemical investigations in relation to enzymes and identification of fish diseases.
- Refinement of techniques for the detection methods for antibiotic residues and bacterial inhibitors in farmed and processed seafood and aquatic environments
- Formulation of standards and code of practices for organic aqua farming and quality of aqua farmed fish products.
- Bio-security of farm environments and farmed products
- Study on bio-preservation of seafood and bio-signalling of seafood quality
- Investigations on antibiotic residues, bacterial inhibitors in processed seafood and aquaculture environment
- Molecular mapping of aquatic microbes as a tool to prevent drain of our genomic wealth
- Development and maintenance of National Collection of Aquatic Fish Bacteria (NCAFB) with supporting genomic database to meet the world trade regime

Adaptive Research

- Fish behaviour studies in relation to harvesting techniques
- Continued evaluation of materials for fishing vessel construction
- Continued evaluation of materials for fishing gear fabrication
- Prevention of and protection from corrosion and biodeterioration of fishing vessels
- Development of cost-effective, innovative, responsible fishing techniques for inland and marine coastal and deep sea fisheries of east and west coast of India
- Design and optimisation of fishing gears for marine and inland water bodies
- Energy conservation in fish harvesting
- Cost reduction in fish harvesting
- Fishing gear engineering
- Environmental impact of fishing gear systems
- Development of by-catch reduction devices
- Scientific inputs for evolution of fisheries legislation for management of Indian fishery resources
- Evaluation of traditional fishing systems and improvement in terms of efficiency, energy consumption and ecological impacts
- Production, processing, preservation and packing technology for value added products.
- Long distance transportation of marine and inland fish with emphasis on live fish and shellfish transportation

- Development of need based, region specific fish processing technologies
- Development of technologies for production of value added products from cold water fishes
- Identification of appropriate packaging materials for fish and products for domestic and overseas markets
- Complete utilization of fish with emphasis on environmental protection
- Development of products of high protein content for community health programmes from farmed fish and by-catch
- Improvement of traditional smoking and curing techniques suitable for different regions including the NEH
- Utilisation of fish wastes for livestock feed and for biomedical use
- Formulation of package of practices for achieving HACCP, SSOP, GMP and GLP in farming and processing of fish and shellfish
- Evaluation of quality in the domestic fish trade chain to identify defects and hazards in the system and to formulate remedial measures
- Development of efficient effluent treatment procedures for fish farms and fish processing industries
- Development of standards for novel and value added products
- Mapping of typical hazards based on geographical location
- Production of nutraceuticals like high protein flours, hydrolysates, calcium and phosphorus supplements and extruded products from low value fishes
- Development of processing machinery for marine, fresh water and farmed fish products
- Application of cryogenic engineering technology for fish processing
- Development of new generation, fuel efficient fishing vessel designs for marine, riverine and reservoir water bodies
- Modernisation of propulsion system and deck equipment for the fishing fleet
- Development of electronic instruments for fish harvesting, fish processing and quality control
- Statistical methods of quality control related to fishery products
- Techno-economic evaluation in production and marketing of fish products
- Popularisation of responsible fishing methods, fish disease prevention practices and methods for reduction of harvest and post harvest losses
- Transfer of technology in harvest and post harvest sectors
- Coastal zone management, adoption of innovation in capture and culture fisheries including sanitary and phyto-sanitary measures, impact of globalization and e-extension
- Impact of globalisation, e-extension, patenting and commercialisation of technologies

Anticipatory Research

- Studies on the immunological aspects of fish diseases and their control
- Application of Satellite Remote Sensing and GIS in fisheries
- Microbial hazard and risk analysis in seafood on a national scale
- Bio remediation of aqua farms using microbial consortiums and environmental impact assessment of aquaculture
- Marketing research for assessment of demands of commodities in the context of WTO

7.3 New Areas of Research in Inland and Aquaculture Sectors

Innovative fishing technologies are to be developed for riverine, reservoir, other inland water bodies and aquaculture ponds. Suitable fishing craft and gear combination for fishing in these systems will be developed. Mechanisation of harvesting in reservoirs will be undertaken on a priority basis. Suitable techniques for processing, packaging and transportation will be evolved. Domestic marketing in inland fisheries has to be explored. Diversification of inland fishery products for internal and export markets will be attempted. Appropriate training programmes for inland fisherwomen, SC/ST/Tribal fishers will be provided in net making, fishing gear maintenance, hygienic handling and preservation, etc.

Engineering equipments for aquaculture sector

Suitable engineering equipments proposed to be developed for aquaculture are given below :

- Economical and efficient aerators and substitution of the presently available imported ones are to be designed and popularised
- Eco-friendly and durable technologies for checking water seepage in aquaculture ponds
- Economical and efficient cage structure for cage culture
- Weed harvester
- Indigenous electronic systems for instantaneous measurement of concentration of cells of micro-algae in hatcheries and in situ measurement of different aquaculture parameters etc.
- Efficient design of sluice gate for aquaculture ponds

National Accreditation Authority

With the proposed development of the Institute it is envisaged that CIFT will act as a National Accreditation Authority for food safety of agriculture/ fishery products. Monitoring and surveillance of other laboratories engaged in testing of food products will also be undertaken.

7.4 New Land Area

In view of the larger development programmes of the institute in the coming years an additional land area of about 5 acres is to be procured on priority basis for housing additional testing and research laboratories, for setting up testing tank etc. It is suggested that the cost of land is to be estimated by a suitable agency for speedy implementation of the proposal.

7.5 New Vessel for Deep Sea Research

New vessel of appropriate size for deep sea research and ocean monitoring which can support work involving under water studies. Berthing facility for large and medium size vessels should be provided for on priority.

7.6 Reorganisation of Research Divisions

In view of the shift in priorities in research, the research divisions of the institute is proposed to be reorganised as under:

1. Fishing Technology
2. Craft Design
3. Fish Processing
4. Food Microbiology and Biotechnology
5. Biochemistry and Nutrition
6. Quality Assurance and Management
7. Extension and Education
8. Statistics, Economics and Marketing
9. Engineering

8. ISSUES AND STRATEGIES

- Long-term sustainability of the fishery resources – marine and inland
- Environmental safety
- Energy conservation in fish harvesting, processing and transportation
- Food safety in fisheries
- Development of value added, ready-to-eat fishery products
- Loss minimisation and waste utilisation
- Development of bioactive substances of pharmacological, nutritional and industrial importance
- Studies on microbial hazards and risk analysis in fish and fishery products
- Continued optimization of fishing gears for aquaculture and inland and marine resource systems in Indian Exclusive Economic Zone
- Conservation of biodiversity through optimisation of fishing efforts, prevention of capture of juveniles and development of Juvenile Fish Excluder Devices (JFED)
- Fishery legislation – control of open access, input and output control
- Development of harvest and post harvest technologies for exploitation and processing of tuna resources
- Post-graduate academic programme in Fishing Technology
- Development and upgradation of preservation, processing and packaging technologies for domestic and overseas markets
- Biochemical aspects of fish disease
- Bio-security of farm environments and farmed products
- Quality improvement through improved handling and processing in the domestic fish trade