Minimum Standards for Higher Agricultural Education (MSHAE)

FISHERIES

Education Division
Indian Council of Agricultural Research
PUSA, New Delhi 110 012

PREFACE

Assurance of quality in Higher Education is receiving great attention inrecent years and Indian Council of Agricultural Research (ICAR) has taken several initiativesto improve and sustain the quality of Higher Agricultural Education. One of the important initiatives is to develop Minimum Standards in the identified 12 disciplines which are being offered under NARS system. These Standards along with the course curricula would certainly help in the establishment of new College to plan, execute and manage the required resources both in terms of infrastructure and manpower for the delivery of quality education.

On behalf of the Committee, I profusely thank ICAR for entrusting this important academic assignment to develop the Minimum Standards of Higher Agricultural Education (MSHAE) in Fisheries Science in terms of infrastructure, laboratories/field facilities, man-power and other support so as to firm up the guidelines for establishing College of Fisheries in SAUs/ ICAR Institutes/Deemed Universities. I wish to place on record my highest regard to Dr S. Ayyappan, Director General, ICAR and Secretary, DARE; sincere thanks to Education Division of ICAR and appreciation to all the Members of Committee, namelyDr. I. J. Singh, Dean, College of Fisheries, G. B. Pant University of Agriculture and Technology, Pantnagar; Dr. H. R. V. Reddy, Director of Research, KVAFSU, Bidar and Dr. K. L. Khurana, Principal Scientist, Education Division, ICAR, New Delhi for their contributions and efforts in developing these Minimum Standards. During the meeting of the Committee held at Central Institute of Fisheries Education, Mumbai, the interactions and inputs from the faculty of CIFE especially Dr G. Venkateshwarlu, Dean (Academics) who have helped greatly in formulating these guidelines.

I wish that this document serves for academic planners to draw a road map for establishing College of Fisheries.

(W. S. Lakra)
Chairman

INTRODUCTION

Fisheries sector is the fastest growing food production system during the last three decades with 8.8 % global average annual growth rate. Its significance and contribution towards national economies, livelihood, food and nutritional security, employment generation and foreign exchange earnings have been enormous.India is endowed withvast and diverse marine and inland fisheries resources and development of skilled manpower is imperative to effectively manage these resources for judicious utilization and sustainable fish production. India is witnessing a sea change in its activities on the fisheries horizon. With the marine fish production becoming static, aquaculture has now emerged as a coveted business. It is receiving increasing interest and investment and has assumed the status of an industry in the country. The changing scenario calls for more efficient management of fisheries and aquaculture programmes in the country. The growth of fisheries and aquaculture activities in the country is throwing up new challenges that call for redesigning and revitalization of fisheries education in India.

Fish is also the most traded primary food commodity with 38% of total production entering international trade. This sector has increasingly been recognized not only as a powerful tool for poverty alleviation by creating sustainable rural livelihoods, but also as a profitable business with one of the highest returns. The rapidly growing fisheries sector, with its enormous potential, requires professional and adequately skilled and competent human resource to plan, execute and manage various fisheries development programs across the country. Besides, nurturing large pool of entrepreneurial talent among farmers and youth would be very essential to fully exploit the huge commercial potential and unlimited business opportunities in aquaculture and fish processing industry.

Globalization, like in other sectors, has thrown up opportunities and risks in the fisheries sector also, necessitating changes in policy and governance in order to maximize benefits and minimize risks through sustainable and responsible fisheries management and production. Further, it is having a profound effect on education too, transforming the economies into knowledge based service and innovation economies. Agricultural education in general and fisheries education in particular is no exception. For Universities Imparting higher education, this new environment holds both threats and opportunities. To benefit from the opportunities as well as address the challenges, fisheries education system should be subjected to constant innovations and reforms, particularly with respect to redesigning of

curricula and syllabi, innovative pedagogy, developmental orientation, entrepreneurship, soft skill development, etc. This is a necessary condition to prepare the graduates and equip them to not only effectively respond to the emerging needs and challenges, but also to become creative and proactive partners in piloting this knowledge-led revolution. Though the basic features of the Indian fisheries educational system are impressive, to meet the new challenges, the concerted efforts are needed to improve the infrastructure in colleges and employ competent faculty.

In this background, the ICAR which is vested with responsibilities of guiding and coordinating agricultural education in the country has taken several steps to ensure quality education to meet the ever changing national and global scenario in fisheries sciences. One of these new initiatives is to formulate the comprehensive minimum requirements and standards for establishing Colleges of Fisheries in Agricultural Universities, ICAR institutes and Deemed Universities. These guidelines encompassing standards and basic requirements, certainly, would help in establishment of new colleges towards ensuring the delivery of high quality education and strengthening research capabilities in the subject.

Central Institute of Fisheries Education, Mumbai

Proceedings of the meeting of the ICAR's Expert Committee to work out the **Minimum Standards of Higher Agricultural Education (MSHAE) in Fisheries Science** in terms of infrastructure, laboratories/field facilities, faculty, man-power and other support so as to firm up the guidelines for establishing College of Fisheries in SAUs/ ICAR Institutes/Deemed Universities, held at Central Institute of Fisheries Education, Mumbai during 13-14 May, 2014.

Following committee members attended the meeting:

1.	Dr. W. S. Lakra, Director, Central Institute of Fisheries Education, Mumbai	Chairman
2.	Dr. I. J. Singh, Dean, College of fisheries, G. B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand	Member
3.	Dr. H. R. V. Reddy, Director of Research, KVAFSU, Bidar, Karnataka	Member
4.	Dr. K. L. Khurana, Principal Scientist, Education Division, ICAR, New Delhi	Member Secretary

The following faculty also attended the meeting as Special Invitees:

1.	Dr. A.K. Pal, Joint Director
2.	Dr. S.K. Chakraborty, Head, FRHPHM Division
3.	Dr G.R.DeshBandhu, Senior Registrar
4.	Dr G.Venkateshwarlu, Dean (Academics)
5.	Dr. AparnaChaudhari, Associate Dean
6.	Dr B.B. Nayak, Principal Scientist, FRHPHM Division
7.	Dr. K.Pani Prasad, Principal Scientist, AEHM Division
8.	Dr. P.P.Srivastava, Principal Scientist, FNBP Division
9.	Dr. Chandra Prakash, Senior Scientist, Aquaculture Division
10.	Dr Subodh Gupta, Senior Scientist, FNBP Division
11.	Dr A.K.Balange, Senior Scientist, FRHPHM Division
12	Dr A.Pavan Kumar, Scientist, FGB Division

The chairman of the committee, Dr W. S. Lakra, welcomed the committee members and acknowledged the ICAR for providing an opportunity to the CIFE, Mumbai for hosting this important meeting. Dr W. S. Lakra explained the house regarding the background under which the committee was constituted by the ICAR and the importance of HigherFisheries Education which is being imparted by about 20 Fisheries Colleges and two Fisheries Universities in the States and a Deemed University in the Central sector. The Chairman also highlighted about the potential of fisheries and aquaculture development in the country and HRD requirement.

Dr K.L.Khurana, in his opening remarks elaborated on the initiatives taken by ICAR for taking up this task to workout minimum standards and requirements for opening new college offering undergraduate and postgraduate degrees in the discipline of Fisheries. He also mentioned theplans of ICAR to bring our compendium encompassing the minimum standards for establishing college of fisheries, the syllabus of UG programme developed by Fourth Deans committee and the Syllabus of PG programmes developed by the Broad Subject Matter Area Committee (BSMAC) of Fisheries Science.

Dr I. J. Singh shared his experience of the earlier Deans' Meeting and its recommendations regarding the number of Departments and their nomenclature. Dr. H. R. V. Reddy provided the details of prevailing framework of College of Fisheries. On behalf of the Chairman, Dr G.Venkateshwarlu, Dean, CIFE made a presentation on proposed Minimum Standards of Higher Agricultural Education (MSHAE) in terms of infrastructure, laboratories/field facilities, faculty, man-power and other support so as to firm up guidelines for establishing College of Fisheries. After thorough deliberations on the presentation and based on the suggestions from the esteemed members of the committee and other invitees, the final report has been prepared which is enclosed as Annexure-I.

(I. J. Singh)
Member

(H. R. V. Reddy)
Member

(K.L.Khurana)
Member Secretary

(W. S. Lakra)
Chairman

Annexure-I

Minimum Standards for Establishing College of Fisheries in Agricultural Universities

1. Departments

1.	Department of Aquaculture (AQ)
2.	Departmentof FisheriesResource Management (FRM)
3.	Department of Fish Harvest and Post-harvest Technology (PHT)
4.	Departmentof Aquatic EnvironmentManagement (AEM)
5.	Department of Fish Genetics and Biotechnology (FGB)
6.	Department of Fish Health Management (FHM)
7.	Department of Fish Nutrition and Feed Technology (FNFT)
8.	Department of Fisheries Extension & Humanities (FEH)

2. Degree Programmes

A. Undergraduate : Bachelor of Fisheries Science

B. Postgraduate Programmes (M.F.Sc. and Ph.D.)

Sl No.	**Disciplines**
1	Aquaculture
2	Fisheries Resource Management
3	Fish Processing Technology
4	Aquatic Environment Management
5	Fish Genetics and Breeding
6	Fish Biotechnology
7	Fish Physiology and Biochemistry
8	Fish Health Management
9	Fish Nutrition and Feed Technology
10	Fisheries Extension
11	Fisheries Economics

3. Eligibility Criteria

Bachelor of Fisheries Science	Higher Secondary/10+2/Intermediate Subjects: PCMB/PCB/Inter (Agriculture) (P, C, M and B are Physics, Chemistry, Mathematics and Biology, respectively)
Masters in Fisheries Science	B.F.Sc. (10+2+4 system)
Ph.D. in Fisheries Science	B.F.Sc.(4 years) +M.F.Sc. (2 years)

4. Medium of Instruction: English

5. Intake Capacity

A. Bachelor of Fisheries Science (B.F.Sc.) : 40

B. Masters in Fisheries Science (M.F.Sc.)

Discipline	**Suggested Intake/Year**
Aquaculture	8
Fisheries Resource Management	4
Fish Processing Technology	4
Aquatic Environment Management	3
Fish Genetics and Breeding	3
Fish Biotechnology	3
Fish Health Management	3
Fish Nutrition and Feed Technology	3
Fish Physiology and Biochemistry	3
Fisheries Extension	3
Fisheries Economics	3

C. Doctoral Programmes (Ph.D.)

Aquaculture	4
Fisheries Resource Management	3
Fish Processing Technology	3
Fish Genetics & Breeding	2
Fish Biotechnology	2
Aquatic Environment Management	2
Fish Health Management	2
Fish Nutrition and Feed Technology	2
Fish Physiology and Biochemistry	2
Fisheries Extension	1
Fisheries Economics	1

6. Land Requirements

Main building and hostels:	4 ha
Instructional FarmArea:	20 ha
Play grounds& other amenities:	2ha
Total:	**26 ha**

Geographical location:

For Maritime States the most ideal location is near the coast line having access to open sea, estuaries, fishing harbours and fish processing plants with a good water source.

For Inland States, the location needs to be close to water bodies / Farm facilities.

For Hilly Regions, the land requirement may be less as per availability

7. Manpower Requirements of Dean's Office

Manpower	Number
Dean	1
A. Establishment	
PA to Dean	1
Administrative Officer	1
Superintendent	3
Steno	1
Assistant	3
Operator (Audio Visual)	1
Attendants/Messengers	4
Clerk (LDC)	4
Electrician	1
Plumber	1
Store Keeper	1
Security, Sanitation, transport and Landscaping	To be outsourced as per the requirement
B. Central Instrumentation Facilities	
Computer Assistant	1
Laboratory Technicians	2
Laboratory Assistant	1
Laboratory Attendant	3
C. Library Staff	
Assistant Librarian	1
Library Assistant	1
Clerk	1
Library attendant	2

D. Instructional Fish Farm & Hatchery	
Farm Manager	1
Field Assistant	1
Laboratory Assistant	1
Field Attendant	2
Field Staff / Fishermen	20
Security	(to be outsourced)
E. Students Welfare	
Assistant Director (Students' Welfare)	1
Medical Officer	1
Assistant Professor (Physical Education for Boys and Girls)	1+1
E. Hostel (Boys and Girls)	
Wardens	1+1
Assistant Wardens	1+1
Clerk (LDC)	2
Attendants	4
Security, Sanitation, Boarding and Landscaping	To be outsourced

8. Faculty Requirements for Departments*

Department	Faculty			Total
	Professor	**Associate Professor**	**Assistant Professor**	
Aquaculture	1	2	3	6
Fisheries Resource Management	1	2	3	6
Fish Harvest and Post-harvest Technology	1	3	5	9
Aquatic Environment Management	1	1	3	5
Fish Genetics and Biotechnology	1	1	2	4
Fish Health Management	1	1	2	4
Fish Nutrition and Feed Technology	1	1	2	4
Fisheries Extension & Humanities	1	1	2	4
Total	**8**	**12**	**22**	**42**

*Additional faculty requirement for the Departments offering PG Degrees: 1 Professor, 2 Associate Professors and 2 Assistant Professors

9. Administrative and Supporting Staff for Departments

Department	Assistant	Attendant/ Messenger	Clerk	Laboratory Assistant/ Attendant
Aquaculture	1	2	1	4
Fisheries Resource Management	1	2	1	2
Fish Harvest and Post-harvest Technology	1	1	1	4
Aquatic Environment Management	1	1	1	2
Fish Genetics and Biotechnology	1	1	1	2
Fish Health Management	1	1	1	2
Fish Nutrition and Feed Technology	1	1	1	2
Fisheries Extension & Humanities	1	1	1	2
Total	**8**	**10**	**8**	**20**

10. Faculty Expertise

Department	Faculty Expertise
Aquaculture	- Inland Aquaculture -Freshwater Aquaculture -Brackish water Aquaculture -Mariculture -Ornamental fish culture -Cage Culture -Culture of Fish Food organisms -Aquaponics - Finfish & shellfish breeding and seed production -Brood stock and hatchery management -Aquaculture Engineering -Fish Farm Management
Fisheries Resource Management	- Anatomy & Biology of Fishes - Population Dynamics - Stock Assessment - Taxonomy of Fishes - Marine, Inland &Brackishwater Fisheries - Fishery Regulations and Laws - Conservation & Biodiversity
Fish Harvest and Post-harvest Technology	- Fishing gear & craft technology - Equipment Engineering & plant maintenance - Refrigeration Engineering - Marine Engines - Navigation & Seamanship - Fishing Technology - Freezing Technology - Thermal processing - Fish Processing, Product Development and waste utilization - Quality Control - Packaging Technology
Aquatic Environment Management	- Analytical Water & Soil Chemistry - Limnology - Meteorology - Physical , Chemical and Biological Oceanography - Geography - Aquatic Pollution - Aquatic Environment & Biodiversity -Planktonology

Fish Genetics and Biotechnology	-Genetics and Breeding -Molecular Biology -Genetic Engineering - Biochemistry - Physiology
Fish Health Management	-Fish Microbiology -Immunology -Parasitology -Pathology -Fish Disease diagnostics and management
Fish Nutrition and Feed Technology	- Fish Nutrition - Feed Technology - Feed formulation and Processing, -Nutritional Biochemistry
Fisheries Extension & Humanities	- Fisheries Administration - Project Formulation &Finance - Extension Programme Planning - Co-operative & Marketing management - Computer Science - Fisheries Statistics - Fisheries Economics - Rural Sociology & Extension education - Communication Skills - Business Organisation &Personnel Management

11. Department-wise Laboratories*

Department	Laboratory
Aquaculture	- Finfish & shellfish breeding - Ornamental fish breeding & culture
Fisheries Resource Management	- Fish Anatomy and Biology - Museum - GIS and Remote sensing
Fish Harvest and Post-harvest Technology	- Fishing gears and craft (with net mending facility) - Navigation tools - Fisheries Engineering - Biochemistry - Quality control - Microbiology

	- Fish Processing and packaging
Aquatic Environment Management	-Physical Oceanography -Toxicology and Bioassay -Water and Sediment Quality Analysis
Fish Genetics and Biotechnology	- Genetics - Biochemistry -Physiology - Biotechnology
Fish Health Management	-Microbiology -Immunology -Parasitology -Pathology -Disease Diagnosis
Fish Nutrition and Feed Technology	-Nutrition -Feed Analysis -Feed mill
Fisheries Extension & Humanities	- Extension - Economics -Statistics -Computer Laboratory

*Each Department should have minimum of one UG, one PG and one research laboratories

12. Floor Space Requirement

A. Central Facilities

S. No.	Details	Number of Rooms	Dimensions
1.	Dean office	1	20′ x 24′
2.	PA room	1	20′ x 12′
3.	Committee room with video conferencing facility	1	20′ x 48′
4.	Administrative officer room	1	20′ x 12′
5.	Admin. Staff rooms	3	20′ x 36′ each
6.	Examination cell	1	20′ x 12′
7.	Evaluation room	1	20′ x 36′
8.	Faculty room	1	20′ x 12′ each
9.	Placement cell	1	20′ x 48′
10.	Smart Lecture rooms	8	Seating capacity –50
11.	Auditorium (optional)	1	Seating capacity – 300
12.	Library/Book bank	1	30′ x 72′
13.	Examination hall (optional)	1	Seating capacity – 300
14.	Multipurpose room	1	20′ x 36′
15.	Laboratories	25	30′ x 48′ each / as per requirement
16.	Hostels	2 hostels	UG and PG Boys, UG and PG Girls
17.	Generator shed	1	20′ x 36′
19.	Toxic chemical waste storage/disposal Unit	1	20′ x 24′
20.	Canteen	1	20′ x 12′ (kitchen) & 20 x 36′ (sitting)
21.	Toilets	-	2 sets for each floor
22.	Parking space	As per requirement	For college and hostels
23.	Vehicles: Office car Staff car/Jeep Bus Pick-up van		 1 3 1 1

B. Departments

S. No.	Detail	Number of rooms	Dimensions
1.	Head of the Department	8 (one for every Department)	20′ x 24′ each
2.	Administrative Staff	8 (one for every Department)	20′ x 36′ each
3.	Faculty room	21 (as per faculty strength)	20′ x 24′ (3 rooms) 20′ x 12′ (18 rooms)
4.	Rooms for Research Scholars	8(one for every Department)	20′ x 24′ each
5.	Committee room cum library	8 (one for every Department)	20′ x 36′ each
6.	Smart Lecture cum seminar room	8 (one for every Department)	Seating capacity – 50 each

13. Equipments Requirement

A. Central Instrumentation Facility

S. No.	Name of the Equipment	Number
1	Cold room -20 $^{\circ}$C	1
2	-80^{0} C freezer	1
3	Chill room 4 $^{\circ}$C	1
4	High Speed Centrifuge	1
5	HPLC,	1
6	GCMS	1
7	Gel doc system	1
8	Real time PCR	1
9	Research Vessel	1
10	Ultra Centrifuge	1
11	Programmable Freezer (Cryopreservation)	
12	Water Purification Unit	As per requirement
13	Ice flaker	1
14	Freeze Dryer	1
15	Atomic Absorption Spectrophotometer (AAS)	1
16	Automatic Tissue Processor	1
17	Microtome	1
18	Inverted Microscope	1
19	Generator	1

B. Instructional Farm Facilities

1	Nursery ponds	20
2	Rearing Ponds	8
3	Stocking ponds	4
4	Brood stock ponds	4
5	Chinese Circular hatchery	1
6	Wetlab facilities	As per requirement
7	Re-circulatory Systems	1

Departmental Laboratories

S. No.	Name of the Equipment	Total number
1.	-20 °C Freezer	7
2.	-80 °C Freezer	3
3.	Autoclaves	7
4.	Biosafety Cabinet	3
5.	Centrifuge	7
6.	Refrigerated Centrifuge	7
7.	Cryo-cans	6
8.	Analytical balance	7
9.	Stirrer	7
10.	Spectrophotometer	7
11.	Research Microscope	70
12.	Micropipette set	7
13.	Thermocycler	7
14.	Waterbath (Digital)	7
15.	Salino meter (Refracto meter)	6
16.	Dissolved oxygen analyzer	2
17.	Hot air oven	7
18.	Kjeltec for protein estimation	1
19.	Soxhlet for fat estimation	1
20.	Muffle furnace	2
21.	Microtome	1
22.	Fish deboning machine	1
23.	Fish drying & smoking kiln	1
24.	Vacuum packing machine	1
25.	Modified atmosphere	1

	packaging	
26.	pH meter	7
27.	Computers	7
28.	Incubator	7
29.	Digital colony counter	3
30.	Binocular Microscope	140
31.	Bomb Calorimeter	1
32.	Automatic Water Analyzer	2