



Building A Strategic Framework For Aquaculture Education In Kenya

POLICY FRAMEWORK FOR AQUACULTURE EDUCATION IN KENYA



March 2021



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This policy framework was developed within the TEAM project “Building a Strategic Framework for Aquaculture Education in Kenya” Project No. KE2017TEA443A103 funded by the Flemish Inter-University Council (VLIR-UOS).

Citation

Nyonje, B., Nangulu, A., Van Stappen, G., Obiero, K., Opiyo, M.A., Awuor, J.F., Pynoo, B., Kisaka, L., Nevejan, N., Ngiri, J., Maina, J., and Ogello, E. (2021). Policy Framework for Aquaculture Education in Kenya, KMFRI, Kenya. 21 pp.

Printed in Kenya 2021

Cover picture showing a Student on attachment inducing Africa catfish at KMFRI Sagana.
Picture taken by Dr. Mary Opiyo.

Abbreviations and Acronyms

CAADP	Comprehensive Africa Agriculture Development Programme of the African Union
CATS	Credit Accumulation and Transfer System
CBC	Competency Based Curricula
CBO	Community Based Organization
CDACC	Curriculum Development Accreditation and Certification Council
CESA	Continental Education Strategy for Africa
CUE	Commission for University Education
KICD	Kenya Institute of Curriculum Development
KNQF	Kenya National Qualification Framework
KUCCPS	Kenya Universities and Colleges Central Placement Service
MoA	Memorandum of Agreement
MoU	Memorandum of Understanding
NACOSTI	National Commission for Science, Technology and Innovation
NEPAD	New Partnership for Africa's Development
NGO	Non-Governmental Organizations
SDG	Sustainable Development Goals
TIMPs	Technological, Innovation and Best Management practices
ToT	Training of Trainers
TVET	Technical-Vocational Education and Training
TVET-A	Technical-Vocational Education and Training Authority
UFB	University Funding Board

Executive Summary

This policy framework aims to strengthen Kenya’s aquaculture education programmes for improved academic training in Universities and Vocational Aquaculture Training Institutions. The policy framework is anchored on the United Nation’s Sustainable Development Goals (SDGs) focusing on SDG 1 (No Poverty), SDG 2 (Zero Hunger), SDG 4 (Quality Education) and SDG 14 (Life Below Water). It is in line with the Comprehensive Africa Agriculture Development Programme (CAADP) of the African Union and New Partnership for Africa’s Development (NEPAD) agenda. The policy framework also resonates with the Africa Union Agenda 2063 blueprint, a master plan for transforming Africa into a global powerhouse of the future. The recommendations take into consideration the regional aspiration contained in East Africa Community (EAC) Vision 2050 Agenda, in which Member States aspire to become middle-income countries, Kenya’s Vision 2030 blueprint and Kenya’s “Big 4 Priority agenda” (2017-2022) focusing on food and nutrition security.

The framework aims to tackle some of the perennial challenges in the aquaculture educational landscape including; limited knowledge, skills and innovative capacity to operationalize and commercialize technological advancements in fish production such as culture systems, fish breeding and genetics; fish nutrition, health management and post-harvest technologies⁽¹⁾. Specifically, the higher/university and technical vocational education training institutions are currently offering theoretical knowledge with minimal practical “hands-on” skills due to inadequate infrastructure. On the other hand, the advisory by extension service providers is insufficient to promote the adoption of new farming Technologies, Innovations and Management Practices (TIMPs)⁽²⁾. This policy framework recognizes that educational and vocational training reforms in the aquaculture sector will improve fish husbandry skills, thereby resulting in increased productivity, revenue generation and higher economic growth for sustainable development.

This framework includes perspectives from the aquaculture labour market, alumni and extension service providers. Data was gathered via mixed methods using semi-structured interviews, site visits and a multi-stakeholder engagement in various

1 Veberica, K. L., Omolo, B. O., Amadiva, J., & Bowman, J. R. (2015). Aquaculture Training for Kenyan Fisheries Officers and University Students. In PD/A CRSP Seventeenth Annual Technical Report (p. 4pp). Oregon University, USA. <http://pdacrsp.oregonstate.edu/pubs/technical/17tch/9ADR3>.

2 Suvedi, M., Ghimire, R., & Kaplowitz, M. (2017). Farmers’ participation in extension programmes and technology adoption in rural Nepal: a logistic regression analysis. *The Journal of Agricultural Education and Extension*, 23(4), 351–371. <https://doi.org/10.1080/1389224X.2017.1323653>

Counties in Kenya. Results indicated that employers from both public and private sectors were moderately satisfied with their employees' knowledge and skills. There was inadequate practical training and capacity-building opportunities for on-site and lifelong learning. The academic staff in universities offering fisheries and aquaculture had PhDs in different areas of specialization but had a high workload leading to low engagement with the industry.

This framework will guide the improvement of human capital and provision of adequate skills in the fisheries and aquaculture sector. It will form a key reference document for those involved directly or indirectly in making policy decisions on aquaculture-related educational programs. Similarly, the results will be vital to evaluating interventions, future planning and understanding of the dynamics that influence aquaculture education programmes.

To strengthen aquaculture education programmes in Kenya, the following interventions need to be initiated;

- The National Treasury and line Ministries to allocate adequate funding and resources to universities and TVET institutions for adequate training and demonstration facilities.
- The Commission for University Education (CUE), Technical and Vocational Training Authority (TVETA), University Funding Board (UFB) and Kenya Universities and Colleges Central Placement Service (KUCCPS) to consult with Universities and TVET institutions to periodically review entry subject cluster requirements to enhance student enrolment and financing in aquaculture programmes.
- Universities and Technical Vocational Education Training Institutions to identify and develop an institutional niche and offer academic programmes aligned to their niche for optimal utilization of resources and facilities.
- Forging partnerships, collaborations and linkages with relevant Ministry, Industry and funding agencies for resource mobilization, allocation and sharing of human capital, training and research facilities.
- Review and revision of curricula at tertiary levels to improve youth employability in line with Kenya's Vision 2030, Continental Education Strategy for Africa (CESA) 16-25 and SDG targets.
- Facilitating extension service providers in terms of transport and equipment, improved training materials and tools, and regular/frequent farm visits to farmers to improve training and service delivery.

- Collaborating with national, regional and international academic, research institutions, private sector, industry and other stakeholders in sharing human capital and infrastructural facilities to promote innovative aquaculture technologies

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1.0 Introduction

The development and exploitation of Kenya’s aquaculture resources have the potential to contribute towards the attainment of the national strategy anchored on Vision 2030 and the “Big Four” Agenda owing to the forward and backward linkages with other productive sectors. The sector can contribute significantly to food security, wealth and employment creation. Universities and technical vocational education training institutions play an important role in knowledge creation, building capacity for the labour market and marketing, and the development of entrepreneurial skills for improved livelihoods. Kenya has made progress in recent years with increased enrolment numbers for primary and secondary education due to the free primary education and 100% transition government policy⁽³⁾. Kenya is experiencing a skewed skills mix, particularly skewed towards more university graduates compared to the technicians and artisans who are required in the aquaculture industry. Low numbers of qualified human capital is an impediment to response to the fast-moving technological advancements to bolster adoption and upscaling of technologies for sustainable development of the aquaculture industry. The aquaculture training landscape and existing curricula do not sufficiently address specific skills and competencies, leading to inadequate proficient graduates in the aquaculture industry. These inadequacies are often compounded by insufficient financial and infrastructural facilities in universities and technical vocational training institutions. To solve these protracted challenges, the existing curricula and labour market requirements of the aquaculture industry in Kenya were analyzed to map out existing gaps, and to design a strategic framework for aquaculture education.

3 NESP (2015) Basic Education Programme Rationale and Approach 2013 - 2018, Ministry of Education, Science and Technology, Republic of Kenya

2.0 Situation Analysis

Kenya is ranked fourth in aquaculture production in Africa, mainly from Nile tilapia (*Oreochromis niloticus*) and African catfish (*Clarias gariepinus*). Aquaculture production in Kenya is low despite the high potential in aquatic resources and demand for fish. Based on available data, only 0.014% of the 1.4 million ha of potential aquaculture sites are used, and 95% of aquaculture is practiced in small-scale ponds characterized by low production⁽⁴⁾. The low production and under exploitation of the aquaculture resources are attributed to inadequate qualified human capital in the sector. These inadequacies include:-

- Limited knowledge, skills and innovative capacity to operationalize and commercialize technological advancements in fish production such as culture systems, fish breeding and genetics; fish nutrition, health management and post-harvest technologies⁽⁵⁾.
- The universities and technical vocational education training institutions are offering theoretical knowledge with minimal practical “hands-on” skills due to inadequate infrastructure.
- The advisory by extension service providers is insufficient to enable fish farmers to adopt new farming Technologies, Innovations and Management Practices (TIMPs) for sustainable aquaculture production⁽⁶⁾.

4 Opiyo, M. A., Marijani, E., Muendo, P., Odede, R., Leschen, W., & Charo-Karisa, H. (2018). A review of aquaculture production and health management practices of farmed fish in Kenya. *International Journal of Veterinary Science and Medicine*, 6(2), 141–148. <https://doi.org/10.1016/j.ijvsm.2018.07.001>

5 Vererica, K. L., Omolo, B. O., Amadiva, J., & Bowman, J. R. (2015). Aquaculture Training for Kenyan Fisheries Officers and University Students. In PD/A CRSP Seventeenth Annual Technical Report (p. 4pp). Oregon University, USA. <http://pdacrsp.oregonstate.edu/pubs/technical/17tch/9ADR3.pdf>

6 Suvedi, M., Ghimire, R., & Kaplowitz, M. (2017). Farmers’ participation in extension programmes and technology adoption in rural Nepal: a logistic regression analysis. *The Journal of Agricultural Education and Extension*, 23(4), 351–371. <https://doi.org/10.1080/1389224X.2017.1323653>

3.0 Key Findings

3.1 Labour Market of the Aquaculture Sector in Kenya

- The aquaculture sector, especially in the private sector (grow-out farms, hatcheries) is male-dominated (71%) and mainly comprises of people between 40-49 years; other functions in the private sector (Fish traders, Input suppliers), and positions within the public sector (Fisheries officers, Directors Lectures, Researchers, Teaching Assistants) showed better gender balance.
- For the educational level, the public and private sectors showed a different pattern; in the public sector, staff had all levels of academic qualifications (certificate, diploma, BSc, MSc, PhD) depending on the position. In the private sector, there was a domination of staff with certificate level of training and to a lesser extent diploma holders, except for managerial functions where people employed had higher qualifications (although it was not uncommon to have staff with certificate level also at these higher positions), especially for male staff members in this position.
- Fish processing and hatchery operations were regarded as the most economically viable enterprises in aquaculture.
- There was approximately 30% labour turnover in the middle cadre due to low incentives compelling them to explore other opportunities within and outside the sector.
- Diploma and certificate holders were the preferred employees in fish farms and hatcheries. Degree holders were mainly engaged as farm managers, researchers, instructors in higher education institutions, fisheries officers at County and National government levels, though these positions were limited.
- Employers from the public and private sectors were moderately to highly satisfied with the employees' knowledge and skills.
- There was low uptake of training opportunities among employees due to inadequate funding for on-job training and skill development. Although there was government support to enhance skills development through study leave programmes, most employees funded their training.
- Capacity building and training opportunities existed for on-site and lifelong learning within the framework of sustainable development goals and for on-job induction and training upon recruitment.

- The universities and technical vocational education training institutions had weak linkages with the industry to impart graduates with the requisite knowledge, skills and competencies in the sector.

3.2 Aquaculture Alumni

Very few institutions had alumni offices in place and tracing of alumni was non-existing. However, the alumni had social media platforms for their interaction and networking. There were no formal channels to evaluate the impact of education on the graduates' career in the end. The majority of alumni were;

- Male (75%), with an average age of 30 years, of which 71% were in gainful employment with work experience of more than five years.
- Working in the aquaculture sector, of which 35% worked in private companies and fish farms, 20% in government agencies, 17% in research institutions, while 28% worked in Inter-Governmental Organizations, Non-Governmental Organization (NGOs), Community Based Organizations (CBOs), and self-employment.
- Satisfied with their academic training, current occupation and work performance.

3.3 Aquaculture Extension Service

- The majority of the extension service providers were male (82%); 7% had secondary education with on-job training, 20% had certificate, 41% attained diploma, 23% degree and 9% postgraduate qualification.
- Where extension service providers had a high level of education coupled with frequent visits to fish farms, farmers were more likely to adopt new aquaculture technologies.
- Where extension service providers had on-job training, they had adequate knowledge, skills delivery of advisory services, transfer of technologies and information dissemination.
- Extension services were helpful to farmers and outcomes varied among farmers.
- Cumulatively, fish farmers preferred mixed methods of extension information delivery, with a preference for individual farm visits (72%), farmer group meetings (53%), and agricultural shows/trade fairs (28%).
- The acquired knowledge and skills from extension service providers resulted in improved farm productivity and yields.

- There was inadequate funding for extension in terms of transport, tools and information materials, equipment, inadequate staff and training.

3.4 Status of Aquaculture Education Programmes

Aquaculture academic programmes and staff workload

- There were no academic degree programmes exclusively on aquaculture.
- The academic programmes offered at degree, diploma and certificate level were on; Fisheries and Aquaculture, Aquatic Resources Conservation and Development, Fisheries and Aquatic Sciences, Fisheries and Aquaculture Management, Fisheries Management and Aquaculture Technology and Aquaculture and Fisheries Management.
- Only one TVET institution offered an academic programme exclusively on aquaculture at the certificate level.
- Academic programmes had different names with similar content and a few unique courses on aquaculture studies.
- Most academic institutions had inadequate academic and research leaders at the level of senior lecturer and above.
- The institutions had full-time lecturers who were PhD and Masters holders and part-time lecturers to teach some courses.
- More than 75% of academic staff in universities offering fisheries and aquaculture had PhDs in different areas of specialization.
- The inadequacy in staffing resulted in a high workload among the full-time lecturers in teaching and students' supervision, leaving minimal time for research, mentorship and outreach programmes.
- Undergraduates were introduced to research, but there was limited involvement in funded research projects.

Teaching personnel, infrastructure and materials

- There was low uptake of research funds by academic staff to engage in tangible outcome and impact-oriented research.
- Academic staff had weak linkages with industry and research institutions, which negatively influenced the development of skills and competencies.

- There was weak dissemination of research outcomes to impact livelihoods for sustainable development.
- There were inadequate classrooms, lecture theatres, equipped laboratories and aquaculture facilities for indoor and outdoor practical learning, research, recreational and outreach activities. This was due to inadequate funding in the education sector to construct and/or install and maintain required aquaculture facilities.
- Academic staff had the opportunity and funding by institutions and funding agencies to attend capacity building in pedagogical, andragogical and research initiatives.

Progression and completion rate among undergraduate students

- Across the aquaculture educational landscape, the dropout rate was generally low; consequently leading to high completion rate in all the training institutions.
- There was a decrease in the number of students enrolled to undertake aquaculture programmes in all universities in the last four years. This was due to the low number of students qualifying in science subjects that formed entry subject cluster requirements for aquaculture academic programmes.
- The location of the institutions influenced student enrolment: students preferred universities located in urban areas as opposed to rural areas.
- The Kenya Universities and Colleges Central Placement Service (KUCCPS) and Universities providing options for students to select the institution and academic programmes influenced enrolment in some universities.
- Students are often not well informed when selecting aquaculture programmes and tend to choose programmes perceived as “marketable for employability”.

Quality assurance for academic programmes

- All academic institutions had quality assurance units/directorates that coordinated and monitored the implementation of quality assurance in programmes and operations.
- Assessment of student performance based on academic programmes offered were in two categories; Continuous course assessment test (CATs) and end of year semester examinations.

- Continuous course assessment tests (CATs) entailed; class attendance and participation, take-away and sit-in CATs, presentations, research and project writing and oral presentations that were internally moderated to assure quality.
- End of the semester and end year examinations entailed; academic staff setting, administering, grading of examinations that were internally and externally moderated at university and TVET level to assure quality.
- External quality assurance was governed by CUE at the universities and TVETA at the TVET institutions.
- The terminologies “unit/credit/contact hours” of courses in the academic programmes were used interchangeably by higher learning institutions, which was misleading as a quality assurance measure.
- Evaluation of courses, instructors, resources, facilities and academic programmes by students were in place, but the process of assessment was not effective to provide reliable data for feedback as a quality assurance mechanism.
- Academic programmes accreditation and recognition process were based on laid down standards and guidelines in all universities from the departmental board to school/faculty/directorate/college/academic boards to University Senate for consideration and approval, and to CUE for accreditation and recognition.
- Academic programmes accreditation and recognition process at TVET institutions were based on standards from section to academic boards for approval and to TVETA for accreditation and recognition.

4.0 Policy Recommendations for Different Stakeholders

4.1 Government Ministries, Departments and Agencies (MDAs)

- The Ministry Responsible for Fisheries, Aquaculture and the Blue Economy to facilitate training and internships for extension service providers to enhance practical skills and experience on emerging aquaculture technologies.
- The National and County Governments to enhance opportunities for attachment and internships for Certificate, Diploma and Degree holders to acquire practical skills and experience before employment as extension service providers.
- The National Treasury and line Ministries to allocate adequate funding and resources to universities and TVET institutions for adequate training and demonstration facilities.

4.2 Higher Education and Vocational Training Regulatory Agencies

- The Commission for University Education (CUE), Technical and Vocational Training Authority (TVETA), University Funding Board (UFB) and Kenya Universities and Colleges Central Placement Service (KUCCPS) to consult with Universities and TVET institutions to periodically review entry subject cluster requirements to enhance student enrolment and financing in aquaculture programmes.
- The Kenya Institute of Curriculum Development (KICD), CUE, TVETA, and Kenya National Qualifications Authority (KNQA) to facilitate Training of Trainers (ToT) and the implementation of Competency-Based Curriculum (CBC) at the universities and TVET institutions in alignment with basic training at primary and secondary levels.
- The Commission for University Education (CUE) and Technical and Vocational Training Authority (TVETA) to develop a credit accumulation and transfer system (CATS) to operationalise the Kenya National Qualification Framework (KNQF) alternative pathways.

4.3 Universities and Technical Vocational Education Training Institutions

Training institutions to:-

- Forge partnerships, collaborations and linkages with the relevant Ministry, Industry and Funding agencies for resource mobilization, allocation, sharing of

human capital, training and research facilities.

- Review and revise curricula at tertiary levels to improve youth employability in line with Vision 2030, Continental Education Strategy for Africa (CESA) 16-25 and the United Nations SDG targets.
- Strengthen partnerships, collaborations and institutional arrangements with industry and research institutions to enhance training and continual professional development in fisheries and aquaculture programmes.
- Develop institutional niches and offer academic programmes aligned to their niche for optimal utilization of resources and facilities.
- Share infrastructure for teaching and research in a structured manner for mutual benefits.
- Strategically market programmes to attract self-sponsored students who have successfully completed secondary education and diploma holders from TVET institutions to enroll for University education.
- Provide pedagogical, andragogical and technological training for lecturers/instructors/trainers to integrate digital technologies in learning, research and outreach.
- Institutionalize formative and summative assessment to incorporate practical/experiential teaching, learning, and training, academic advising, supervision and mentorship to develop completely round graduates for sustainable development.
- Undertake tracer studies on alumni and student evaluation of instructor, course resources and facilities for timely feedback on curricula, pedagogy and andragogical strategies, industrial attachment and internships to improve academic programmes and employability.

4.4 Fisheries and Aquaculture Stakeholders and Industry

- Provide adequate attachment and internship opportunities for students from universities and TVET institutions to acquire practical skills and experiential learning for enhanced entrepreneurship and employability.
- Forge collaborations and public-private partnerships in resource mobilization for promoting demand-driven training, research and outreach in the aquaculture sector.
- Avail funds and donations to strengthen public-private partnerships to facilitate training at Universities and TVET Institutions; on-job training and

skill development; and business incubation hubs for knowledge transfer and commercialization.

- Aquaculture stakeholders and value chain actors to mainstream corporate social responsibility and community service in their engagements.

5.0 Policy Framework Implementation Matrix

Policy Framework for Aquaculture Education in Kenya			
Ref #	Policy Framework Action Points	Activities for Implementation	Key Actors
5.1 Government Ministries, Departments and Agencies (MDAs)			
5.1.1	The Ministry Responsible for Fisheries, Aquaculture and the Blue Economy to facilitate training and internships for extension service providers to enhance practical skills and experience in emerging aquaculture technologies.	<ul style="list-style-type: none"> • Conduct survey on training needs and skills gap analysis at County level. • Provide training to extension service providers through on-job training and upgrade the identified skills gaps. • Establish a training programme to support continual professional development of extension service providers by applying gender-responsive and affirmative action strategies. 	KeFS; Relevant departments and agencies at County and National Government level.
5.1.2	The National and County Governments to enhance opportunities for attachment and internships for Certificate, Diploma and Degree holders to acquire practical skills and experience before employment as extension service providers.	<ul style="list-style-type: none"> • Identify opportunities for attachments and internships for Certificate, Diploma and Degree holders. • Enhance deployment for attachment and internship to industry for practical skills and experiential learning. • Promote the acquisition of knowledge, skills and competencies for service delivery, advisory, entrepreneurship and employability. 	Universities and TVET institutions; relevant department and agencies at National and County Government level.

Policy Framework for Aquaculture Education in Kenya			
Ref #	Policy Framework Action Points	Activities for Implementation	Key Actors
5.1.3	The National Treasury and line Ministries to allocate adequate funding and resources to universities and TVET institutions for adequate training and demonstration facilities.	<ul style="list-style-type: none"> • Request for budgetary allocation for recurrent and capital development. • Approve allocation of funds by government organs. • Disburse approved funds for training, resources and demonstration facilities. 	Universities and TVET institutions; The National Treasury; Government organs; Line Ministries.
5.2 Higher Education and Vocational Training Regulatory Agencies			
5.2.1	The Commission for University Education (CUE), Technical and Vocational Training Authority (TVETA), University Funding Board (UFB) and Kenya Universities and Colleges Central Placement Service (KUCCPS) to consult with Universities and TVET institutions to periodically review entry subject cluster requirements to enhance student enrolment and financing in aquaculture programmes.	<ul style="list-style-type: none"> • Undertake situation analysis of existing entry subject clusters requirements, placement and enrolment trends. • Identify stakeholders by area of specialization, induct, assign task, review and validate the revised entry subject clusters for aquaculture programmes. • Submit reviewed and validated entry subject cluster to CUE and TVETA for consideration for approval. 	Universities; TVET institutions; CUE; TVETA; UFB; KUCCPS.

Policy Framework for Aquaculture Education in Kenya			
Ref #	Policy Framework Action Points	Activities for Implementation	Key Actors
		<ul style="list-style-type: none"> Enhance consultation and stakeholder participation among regulatory bodies to consider, adopt and approve reviewed and validated entry subject cluster for implementation by placement service and universities/ TVET institutions. 	
5.2.2	The Kenya Institute of Curriculum Development (KICD), CUE, TVETA, and Kenya National Qualifications Authority (KNQA) to facilitate Training of Trainers (ToT) and the implementation of Competency-Based Curriculum (CBC) at the universities and TVET institutions in alignment with basic training at primary and secondary levels.	<ul style="list-style-type: none"> KICD to sensitize the Universities and TVET institution management on the need for preparation for CBC. Universities and TVET institutions to engage KICD to train ToT at the institutions on CBC. Universities and TVET institutions to put the necessary infrastructure to support CBC. ToT to roll out training on CBC for Universities and TVET institutions. 	Universities; KICD; CUE; TVETA; KNQA.

Policy Framework for Aquaculture Education in Kenya			
Ref #	Policy Framework Action Points	Activities for Implementation	Key Actors
5.2.3	The Commission for University Education (CUE) and Technical and Vocational Training Authority (TVETA) to develop a credit accumulation and transfer system (CATS) to operationalize the Kenya National Qualification Framework (KNQF) alternative pathways.	<ul style="list-style-type: none"> • Conduct a need analysis on Industry and Universities/ TVET Alumni on KNQF alternative pathways. • Conduct stakeholder consultative workshop. • Undertake a validation workshop. • Mobilize the collective efforts of key stakeholders in a harmonized approach to improve the chances of uptake and acceptance of the developed credit accumulation and transfer system. • Operationalize the agreed KNQF alternative pathways. 	CUE; TVETA; CDACC; KNQA; Industry; Universities; TVET institutions.
5.3 Universities and Technical Vocational Education Training Institutions			
5.3.1	Forge partnerships, collaborations and linkages with government Ministries, Departments and Agencies, Industry and Funding agencies for resource	<ul style="list-style-type: none"> • Conduct situation analysis to identify strengths, weaknesses and opportunities. • Identify calls, partners and funding agencies • Strengthen key institutions and encourage collaborations in grant proposal writing for funding. 	Universities; TVET; institutions; Relevant Ministry; Government Organs; Research Institutions; Industry;

Policy Framework for Aquaculture Education in Kenya			
Ref #	Policy Framework Action Points	Activities for Implementation	Key Actors
	mobilization, allocation and sharing of human capital, training and research facilities.	<ul style="list-style-type: none"> • Develop Memorandum of Understanding, Memorandum of Agreements and Collaborative Agreements; and seek approvals. • Allocate funds and share human capital appropriated for training, research and outreach. 	Funding Agencies; National Research Fund; NACOSTI
5.3.2	Review and revise curricula at tertiary levels to improve youth employability in line with Vision 2030, Continental Education Strategy for Africa (CESA) 16-25 and United Nations SDG targets.	<ul style="list-style-type: none"> • Review needs analysis of existing curricula and components. • Promote stakeholder engagement: identify stakeholders by area of specialization, industry employers, alumni and students; induct, assign task, review and validate the revised curricula. • Submit the reviewed and validated/revised curricula for implementation and certification to CUE, TVETA and KNQA for consideration for approval. • Implement the reviewed, revised and validated curricula at the universities and TVET institutions. 	Universities; Curriculum Development Accreditation and Certification Council (CDACC); CUE, TVETA, KNQA, Industry stakeholders.

Policy Framework for Aquaculture Education in Kenya			
Ref #	Policy Framework Action Points	Activities for Implementation	Key Actors
5.3.3	Strengthen partnerships, collaborations and institutional arrangements with industry and research institutions to enhance training and continual professional development in fisheries and aquaculture programmes.	<ul style="list-style-type: none"> • Identify areas and needs for partnerships and collaborations to strengthen training, research and outreach. • Develop Memorandum of Understanding, Memorandum of Agreements and Collaborative Agreements; and seek approvals. • Allocate funds and share human capital appropriated for training, research and outreach. • Benchmark for best practices and initiatives. 	Universities, TVET institutions, Relevant Ministry, Government Organs, Research Institutions, Industry.
5.3.4	Develop institutional niche and offer academic programmes aligned to their niche for optimal utilization of resources and facilities.	<ul style="list-style-type: none"> • Align the niche to institutional vision, mission, philosophy and core values. • Operationalise the niche programme. • Allocate adequate funds to support the branding of the institution’s niche and niche programmes. • Integrate the niche in institutional programmes and operations. 	Relevant Ministry; Universities; TVET institutions; KICD; CUE; TVETA; KNQA; Curriculum Development Accreditation and Certification Council (CDACC).

Policy Framework for Aquaculture Education in Kenya			
Ref #	Policy Framework Action Points	Activities for Implementation	Key Actors
5.3.5	Provide pedagogical, andragogical and technological training for lecturers/instructors/trainers to integrate digital technologies in learning, research and outreach.	<ul style="list-style-type: none"> • Identify pedagogical, andragogical and digital technological training needs. • Engage the pedagogical, andragogical and digital technological trainers, technical experts and resource persons, tap expertise from within or outside the institutions • Roll out training programmes for lecturers/instructors/trainers identified in the institutions and task experts and resource persons to collaborate in implementing the digital technologies. 	Universities; TVET institutions; Ministry responsible for ICT and ICT Authority.
5.3.6	Institutionalize formative and summative assessment to incorporate practical/experiential teaching, learning, and training, academic advising, supervision and mentorship to develop completely round graduates for sustainable development.	<ul style="list-style-type: none"> • Integrate formative and summative modes of assessment in the curricula and implement them in courses/programmes as per the learning outcomes. • Incorporate practical/experiential teaching, learning, and training in curricula/courses. • Assess supervised practicals, reports, presentations and oral examinations in the learning outcomes of these components. 	Universities; TVET institutions; Government Organs responsible.

Policy Framework for Aquaculture Education in Kenya			
Ref #	Policy Framework Action Points	Activities for Implementation	Key Actors
		<ul style="list-style-type: none"> • Institutionalize and train trainers in academic advising, supervision and mentorship. 	
5.3.7	Undertake tracer studies on alumni and student evaluation of instructor, course resources and facilities for timely feedback on curricula, pedagogy and andragogical strategies, industrial attachment and internships to	<ul style="list-style-type: none"> • Establish, operationalise and allocate funding for tracer studies and alumni office at institutional, college and school level. • Establish a database and data management system and mine data to provide feedback on curricula to improve academic programmes and delivery strategies. 	Universities; TVET institutions; students; Alumni.
5.3.8	improve academic programmes and employability. Strategically market programmes to attract self-sponsored students who have successfully completed secondary education and diploma holders from TVET institutions to enroll for University education.	<ul style="list-style-type: none"> • Undertake tracer studies on marketability and employability of alumni. • Integrate alumni and student feedback in the review and enhancement of academic programmes. • Tap into the alumni to avail funding and donations to support institutional programmes. • Establish marketing platforms to encourage learners in enrolment for aquaculture courses. 	Universities; TVET institutions; students; Alumn

Policy Framework for Aquaculture Education in Kenya			
Ref #	Policy Framework Action Points	Activities for Implementation	Key Actors
		<ul style="list-style-type: none"> Establish collaborative partnerships, MoU and MoA between Universities and TVET institutions to encourage transition of students from one level to another. 	
5.4 Fisheries and Aquaculture Stakeholders and Industry			
5.4.1	Provide adequate attachment and internship opportunities for students from universities and TVET institutions to acquire practical skills and experiential learning for enhanced entrepreneurship and employability.	<ul style="list-style-type: none"> Establish collaborative partnerships, MoU and MoA to engage students for attachments and internship. Conduct joint supervision for attachments and internship and assess acquisition of knowledge skills and experiential learning Create entrepreneurial and employment opportunities. Establish and operationalize career and academic advisory services at the universities and the TVET institutions. 	Universities and TVET institutions; Industry.

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5.4.2	Forge collaborations and public-private partnerships in resource mobilization for promoting demand-driven training, research and outreach in the aquaculture sector.	<ul style="list-style-type: none"> • Build capacity on 21st century skills to foster strong collaborations and partnerships • Create an enabling environment for collaborative engagements and public-private partnerships to facilitate MoU and MoA. • Strengthen offices for linkages, collaborations, networking and partnerships at the institutions. 	Universities and TVET institutions; Industry; Research institutions; Donor organizations.
5.4.3	Avail funds and donations to strengthen public-private partnerships to facilitate training at Universities and TVET Institutions; on-job training and skill development; and business incubation hubs for knowledge transfer and commercialization.	<ul style="list-style-type: none"> • Create linkages with philanthropists, industrialists, financial and funding institutions to mobilize funds, donations and endowments for on-job training, business incubation and development of entrepreneurial skills for employability 	Universities; TVET Institutions; Industry; donor organizations.

Policy Framework for Aquaculture Education in Kenya			
Ref #	Policy Framework Action Points	Activities for Implementation	Key Actors
5.4.4	Aquaculture stakeholders and value chain actors to mainstream corporate social responsibility and community service in their engagements	<ul style="list-style-type: none"> • Identify needs in the community • Mobilize funds and resources • Implement social responsibility and community service to impact livelihoods and create legacies. 	Private sector players; Universities; TVET Institutions.

