# BQA NCQF QUALIFICATION TEMPLATE

| SECTION A: | QUALIFICATION DETAILS | | | | | | | | | | | | | | |
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| **QUALIFICATION DEVELOPER (S)** | Botswana University of Agriculture and Natural Resources | | | | | | | | | | | | | | |
| **TITLE** | Bachelor of Science in Fisheries and Aquaculture Sciences | | | | | | | | | **NCQF LEVEL** | 7 | | | | |
| **STRANDS (where applicable)** | 1. N/A<br>2. N/A<br>3. N/A<br>4. N/A | | | | | | | | | | | | | | |
| **FIELD** | Agriculture and Nature Conservation | | | | | | | | | **CREDIT VALUE** | 520 | | | | |
| **SUB FIELD** | Animal Production | | | | | | | | | | | | | | |
| New Qualification | √ | Legacy Qualification | | Renewal Qualification | | | | | | | | | | | |
| | | | | Registration Code | | | | | | | | | | | |
| **SUB-FRAMEWORK** | General Education | | TVET | | Higher Education | √ | | | | | | | | | |
| **QUALIFICATION TYPE** | Certificate | I | | II | | III | | IV | | V | | Diploma | | Bachelor | √ |
| | Bachelor Honours | | Post Graduate Certificate | | Post Graduate Diploma | | | | | | | | | | |
| | Masters | | Doctorate/ PhD | | | | | | | | | | | | |

## RATIONALE AND PURPOSE OF THE QUALIFICATION

**RATIONALE:**

The demand for Graduates in Fisheries and Aquaculture Sciences is growing with the increasing need to manage fisheries and aquatic resources for sustainable development, and ecosystem services. Equally, the demand for sustained protein and food from fish is in high demand globally. In 2016, the

total global fish production reached 171 million tons, of which 88% was utilised for direct human consumption (FAO, 2018). Out of the total fish production in 2017, aquaculture accounted for 47%. Since 1961, the annual global growth in fish consumption has been twice as high as population growth, demonstrating that the fisheries sector is crucial in fighting hunger, malnutrition and poverty. Generally, the contribution of fisheries and aquaculture to economic growth and the fight against poverty is on the increase. In Botswana, the Ministry of Agriculture has developed a National Aquaculture Strategy, which suggests that there is a clear need for Fisheries and Aquaculture professionals in Botswana, at the minimum. The strategy also realises that Botswana imports nearly 3000 tons of fish per annum while the local fish farm production is approximately 100 tons. This suggests that there is a net fish deficit of 2900 tons. Therefore, the promotion of fish farming and advancing skills and knowledge in the sector in Botswana will go a long way in fulfilling the objective of food and nutrition security, employment creation and income generation. It will also help to reduce the national food import bill. From the HRDC report on ***'Priority Skills for 2023/24'***, aquaculture and fish pathology are listed as some of the priority occupation areas in agriculture. SADC has also adopted and developed the AU's Blue Economy, in which fisheries are a key component. Therefore, there is a clear need for Fisheries and Aquaculture professionals in the region.

The need to increase food security, as well as the increased improvement in fish farming implements that are environmentally friendly, demand for skilled, qualified fisheries biologists and aqua-culturists and prompt the need for this qualification. Highly qualified, skilled and competent graduates are a strategic human resource for environmental assessment and evaluation of impacts in developing appropriate policies and strategies for the management and conservation of fisheries and aquatic resources. Qualified graduates will have the capacity to conduct research-based solutions that will avoid, mitigate or compensate for adverse negative impacts on diverse ecosystems. Such an approach will also assist in developing graduates who are able to provide insight and develop aquatic-related management tools, formulate management regulations, terms of reference for impact assessments, environmental impact statements, monitoring, compliance, enforcement and environmental auditing. This is also in line with the national development policies and the UN Sustainable Development Goals. This qualification is designed to contribute towards the government's policy on fisheries and aquatic resources management, conservation and efficient use of these resources through training young professionals who will be the future human capital of the country for the sustainable utilisation of fisheries and aquatic resources.

Currently, Botswana has very few professionals with degrees in Fisheries and Aquaculture Sciences. The need for graduates in Fisheries and Aquaculture Science stems from the realisation that the fish industry is less developed and the potential in this regard is underutilised. Over the past decades, the increase in human population as well as climate change challenges, have contributed to the decline in productive lands for agriculture and feed resources for the livestock sector. Besides, recurrent droughts have also affected adversely the availability of feed and water resources for cattle that negatively contributes to the livelihoods of the nation. As the reliance on cattle is adversely affected by the impact of climate change and the demand for animal-based protein is increasing, alternative protein and income generating sources like the utilisation of fisheries products and aquatic resources are crucial. Furthermore, fish is a cheap source of animal protein and has a better feed conversion ratio compared to other farm animals. Therefore, promoting fish production through the provision of quality training in fisheries and aquaculture is of paramount importance to meet the increasing demand for animal protein. Thus, the introduction of the BSc Degree in Fisheries and Aquaculture Sciences will help address this gap by training the necessary manpower.

**PURPOSE: (itemise exit level outcomes)**

The purpose of this qualification is to produce graduates with specialised knowledge, skills, and capacity to:

1. Apply various aquaculture techniques, including setting up fish farms, fish breeding, broodstock and hatchery management, feed formulation and feeding, disease prevention and control, water quality management, fish harvesting, and marketing.
2. Employ fisheries management principles, including sustainable harvesting practices, stock assessment methods, and regulatory frameworks.
3. Design and conduct experiments, and analyse data, and draw conclusions relevant to fisheries and aquaculture sciences through necessary research and analytical skills.
4. Effectively communicate scientific findings, both orally and in writing, to diverse audiences, including peers, policymakers, and the public.
5. Integrate ethical considerations and environmental impacts related to fisheries and aquaculture practices into decision-making processes

**MINIMUM ENTRY REQUIREMENTS (including access and inclusion)**

The minimum entry requirement for this qualification shall be any of the following:

1. Certificate IV (NCQF level 4) or General Education or TVET or equivalent with passes in Biology, Chemistry and Mathematics
2. Recognition of Prior Learning (RPL): There will be access through Recognition of Prior Learning (RPL) and Credit Accumulation and Transfer (CAT) in accordance with the RPL and CAT National Policies.

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| **SECTION B** | **QUALIFICATION SPECIFICATION** |
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| **GRADUATE PROFILE (LEARNING OUTCOMES)** | **ASSESSMENT CRITERIA** |
| 1. Apply scientific principles applicable to fisheries and aquaculture production systems to develop and implement effective strategies aimed at advancing agricultural production. | 1.1. Engage in research activities to explore current trends, challenges, and innovations in fisheries and aquaculture production systems to identify successful strategies and best practices that can be applied to agricultural production, including fish, towards improve a thriving fisheries sector.<br>1.2. Utilize the acquired knowledge to design customised strategies that address specific needs and goals in agricultural production and fish nutrition.<br>1.3. Implement and monitor devised strategies closely, collecting data on key performance indicators such as growth rates, feed conversion ratios, disease incidence, and environmental impact.<br>1.4. Evaluate the effectiveness of the implemented strategies against predetermined benchmarks and objectives to optimize agricultural production outcomes including fish production systems |

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| | while ensuring sustainability and environmental stewardship. |
| 2. Utilize specialised knowledge of principles and concepts within fisheries and aquaculture sciences, alongside expertise in management processes for conservation planning and environmentally sustainable production systems towards well-thought and informed policy formulation. | 2.1. Implement and monitor applications of specialised knowledge and principles in fisheries and aquaculture sciences for impactful conservation planning and environmentally sustainable production systems for policy formulation and decision-making.<br>2.2. Apply the Aquatic ecosystems concepts for the management, utilisation and conservation of fisheries resources.<br>2.3. Plan and implement conservation strategies, programs and projects on fisheries and aquaculture resources.<br>2.4. Develop and promote awareness programs on fisheries and aquaculture resources to the public and local communities.<br>2.5. Design and implement programs and projects such as aquatic natural resources improvement programs to expand the fisheries and aquatic resource base |
| 3. Employ advanced ICT skills in implementing government policies related to fisheries and aquaculture sciences within the framework of the environmental protection and sustainability agenda. | 3.1. Utilize appropriate methods, skills and tools, including geospatial technologies and information technologies in research and development of sustainable fisheries and aquaculture resources.<br>3.2. Use programming ICT skills in the development of fisheries and aquaculture production systems.<br>3.3. Apply freshwater and aquatic systems analysis tools and software for decision- |

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| | making and project management within environmental protection and sustainability agenda frameworks. |
| 4. Apply entrepreneurship skills to advance and support value chains within the fisheries and aquaculture sector for socio-economic growth and improved food security. | 4.1. Identify and demonstrate opportunities for self employment within the fisheries and aquaculture value chains.<br>4.2. Initiate profitable fisheries and aquaculture enterprises/businesses<br>4.3. Produce fundable fisheries and aquaculture project proposals |
| 5. Apply critical thinking and problem-solving skills to identify emerging issues and opportunities in fisheries and aquaculture, such as climate change impacts, invasive species management, and market trends. | 5.1. Apply knowledge, technical skills, and vocabulary to investigate and analyse changing themes, trends, arguments, and challenges within the area of fisheries and aquaculture production systems.<br>5.2. Utilize knowledge and understanding of current research on drivers of fisheries and aquaculture, their trends, resultant impacts, and their policy implications |
| 6. Conduct an independent and/or group study within the field of fisheries and aquaculture sciences and communicate the results to a diverse array of stakeholders | 6.1. Identify research problems constraining sustainable management, utilisation and conservation of fisheries and aquatic resources<br>6.2. Design, conduct investigations and experiments and analyse data on identified research problems on fisheries and aquaculture resources<br>6.3. Conduct research and identify fish species and aquatic macroinvertebrate families for modelling and mapping. |

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| | 6.4. Communicate effectively, both orally and in writing, through scientific and technical reports associated with fisheries and aquaculture resources.<br>6.5. Present and discuss research findings clearly and succinctly<br>6.6. Demonstrate knowledge and understanding to work effectively as an individual, in teams and in multidisciplinary environments (in the field and laboratory). |

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| **SECTION C** | **QUALIFICATION STRUCTURE** | | | | |
|---|---|---|---|---|---|
| **COMPONENT** | **TITLE** | **Credits Per Relevant NCQF Level** | | | **Total Credits** |
| | | **Level [ 5 ]** | **Level [ 5 ]** | **Level [ 7 ]** | |
| **FUNDAMENTAL COMPONENT**<br>Subjects/ Courses/ Modules/Units | Biology | 12 | | | 12 |
| | Chemistry | 24 | | | 24 |
| | Mathematics | 12 | | | 12 |
| | Swimming | 12 | | | 12 |
| | Zoology | 12 | 12 | | 24 |

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|---|---|---|---|---|---|
| | Computer Skills | | 16 | | 16 |
| | Communication Skills | | 24 | | 24 |
| | Biodiversity | 12 | 12 | | 24 |
| **CORE COMPONENT** Subjects/Courses/ Modules/Units | Aquaculture and Nutrition | | 20 | | 20 |
| | Development of Entrepreneurial Skill in Agribusiness | | 12 | | 12 |
| | Limnology | | 24 | | 24 |
| | Statistics | | 8 | 8 | 16 |
| | Wetland and Ecology Management | | 24 | 12 | 36 |
| | Feed Breeding and Genetics | | 12 | | 12 |
| | Aquatic Microbiology | | 8 | | 8 |
| | Field Practical Training | | 12 | 12 | 24 |
| | Fisheries and Aquaculture Production Systems | | | 56 | 56 |
| | Ecology | | | 24 | 24 |
| | Fish Health | | | 24 | 24 |
| | Geographical Information Systems | | | 12 | 12 |
| | Conservation and Planning | | | 44 | 44 |
| | Project | | | 16 | 16 |
| | Extension | | | 20 | 20 |

| STRANDS/ SPECIALIZATION | Subjects/ Courses/ Modules/Units | Credits Per Relevant NCQF Level | | | Total Credits |
|---|---|---|---|---|---|
| | | Level [ 5 ] | Level [ 6 ] | Level [ 7 ] | |
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| Electives | **(Select two courses from Set of two)** | | | | |
| | Watershed Management<br>OR<br>Freshwater Systems | | | 12 | 12 |
| | Surveying<br>OR<br>Fish Processing and Marketing | | | 12 | 12 |

| SUMMARY OF CREDIT DISTRIBUTION FOR EACH COMPONENT PER NCQF LEVEL | |
|---|---|
| **TOTAL CREDITS PER NCQF LEVEL** | |
| **NCQF Level** | **Credit Value** |
| 5 | 84 |
| 6 | 184 |
| ***7*** | 252 |
| **TOTAL CREDITS** | **520** |

**Rules of Combination:**

**(Please Indicate combinations for the different constituent components of the qualification)**

**Rule of Combinations**

Fundamental component = 148 credits

Core Component = 348 credits

*Elective/Optional* Component = 24 credits

Fundamental and Core courses are all compulsory.

Candidates can choose any two modules in the elective/optional component (each course carries 12 credits)

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## ASSESSMENT ARRANGEMENTS

**Formative assessment**
The contribution of formative assessment to the final grade shall be 50%

**Summative assessment**
The contribution of summative assessment to the final grade shall be 50%

## MODERATION ARRANGEMENTS

There shall be provision for internal and external moderation as a quality assurance measure. Both the internal and external moderators must be registered as moderators and assessors.

## RECOGNITION OF PRIOR LEARNING

Recognition of Prior Learning (RPL) and Credit Accumulation and Transfer (CAT) will be applicable and considered for award of this qualification. Assessment for RPL shall be done as per the individual Educational Training Provider (ETP) policy in line with the national policy on RPL

## CREDIT ACCUMULATION AND TRANSFER

CAT will be applicable and considered for award of this qualification. Assessment for CAT shall be done as per the individual ETP policy in line with the national policy on CAT.

## PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)

**Vertical Progression**

Graduates in Bachelor of Science in Fisheries and Aquaculture Sciences can articulate vertically to NCQF Level 9 qualifications such as:

1. Master of Science in Fisheries and Aquaculture Sciences
2. Master of Science in Biodiversity Conservation
3. Master of Science in Natural Resources Management

**Horizontal Progression**

Graduates in Bachelor of Science in Fisheries and Aquaculture Sciences can articulate horizontally as;

1. Bachelor of Science in Wildlife Management
2. Bachelor of Natural Resources Management
3. Bachelor of Biodiversity Conservation

**Employment Pathways**

Graduates of Bachelor of Science in Fisheries and Aquaculture Sciences can pursue careers as:

1. Fisheries Biologists
2. Aqua-culturists
3. Natural Resources Officers
4. Agricultural Officers
5. Wildlife Officer/Park Managers.
6. Project coordinators
7. Education and outreach officers
8. Fisheries and Aquaculture Consultants

## QUALIFICATION AWARD AND CERTIFICATION

Learners shall be awarded the qualification Bachelor of Science in Fisheries and Aquaculture Sciences upon attaining 520 credits and satisfying the rules of combination stated above. Learners meeting prescribed requirements will be issued a certificate in accordance with prescribed standards ad policies.

## SUMMARY OF REGIONAL AND INTERNATIONAL COMPARABILITY

The developed Bachelor of Science in Fisheries and Aquaculture Sciences qualification was benchmarked against the following qualifications offered by other institutions regionally and internationally:

**Similarities**

The developed qualification title is similar to the regional and international qualifications it was benchmarked against, much closer to the Bachelor of Science in Aquaculture and Fisheries at LUANAR (Malawi), with a duration of studies also similar at 4 years except for The University of Namibia which is 3 years. The main exit outcome of the developed qualification is also anchored at the same level as the qualifications it was benchmarked against, emphasising producing graduates with specialised knowledge, capacity to carry out processes that require the use of specialised basic and applied research and applications of a range of advanced technical processes and skills in their areas of focus. The courses menu, including fundamentals, cores and electives for the developed qualification, also aligns with those of the qualifications it was benchmarked against and with similar assessment strategies with regard to components of assessment and weights. Qualification rules and minimum standards of award of the qualifications are also aligned at which candidates need to progress accordingly through the levels of the respective qualifications to earn the minimum required credits with contributions across fundamentals, cores and electives clearly stipulated.

**Differences**

Some of the qualifications against which the developed qualification was benchmarked appear to use different credit systems despite alignment on a number of courses and content. One of the qualifications benchmarked against (i.e., at the University of Namibia) is a three-year qualification, while the rest are aligned with the developed qualification at four years.

**Concluding Statement**

The developed qualification is similar to the qualifications used for benchmarking in terms of the key modules offered across within the area of fisheries and aquaculture. The closest to the developed qualifications in the region is the Bachelor of Science degree in Aquaculture and Fisheries that is offered by the Lilongwe University of Agriculture and Natural Resources (LUANAR) in Malawi in terms of the course title, modules and the duration of the qualification and entry requirements. Internationally, the proposed qualification is closest to the B.F.S.c qualifications in Fisheries Science offered at the Kerala University of Fisheries and Ocean Studies in India in terms of duration and similarity of course modules. The major difference between the developed qualification and the benchmarked qualifications is the credit systems used despite similarities in course menu across fundamentals, cores and electives.

**REVIEW PERIOD**

The qualification shall be reviewed every 5 years. However, ad-hoc reviews will be done in line with environmental changes after two years.

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**For Official Use Only:**

| **CODE (ID)** | | | |
|---|---|---|---|
| **REGISTRATION STATUS** | **BQA DECISION NO.** | **REGISTRATION START DATE** | **REGISTRATION END DATE** |
| | | | |
| **LAST DATE FOR ENROLMENT** | | **LAST DATE FOR ACHIEVEMENT** | |
| | | | |