QUALIFICATION SPECIFICATION								SECTION A
QUALIFICATION DEVELOPER	Botswana University of Agriculture and Natural Resources							
TITLE	Bachelor of Science in Forest Sciences				**NCQF LEVEL**		07	
FIELD	Agriculture and Nature Conservation			**SUB-FIELD**		Forestry		
New qualification	√		Review of existing qualification					
SUB-FRAMEWORK	General Education		TVET		Higher Education		√	
QUALIFICATION TYPE	Certificate		Diploma		Bachelor		√	
	Bachelor Honours		Master		Doctor			
CREDIT VALUE					**524**			

RATIONALE AND PURPOSE OF THE QUALIFICATION

Rationale

According to the Agricultural Sector Human Resource Development Plan (HRDC, 2015), compared with other sectors, the forest sector is largely underdeveloped with most producers located in the northern part of the country on a seasonal and subsistence basis. Therefore, the need to do more to develop forestry aquaculture and agroforestry has been emphasized. Hence, this qualification aims at producing qualified experts with practical skills that will contribute to the achievement of Vision 2036 through the management, sustainable utilization and conservation of forest and woodland resources.

A needs assessment survey was conducted to establish whether the qualification required was viable. The responses from the survey were positive with aspiration and conviction that the qualification was contemporary, needed, and sustainable. The courses building this provide students with the necessary mix of technical and innovative skills to qualify them as forest scientists.

Purpose

The qualifications will equip candidates with relevant knowledge, skills and competence to:

- understanding of principles and concepts of forest science and its application.
- plan, manage, utilize, and conserve forest and woodland resources.

- plan and execute research in the field of forest science and critically evaluate the results and formulate relevant evidence-based models.
- communicate information and ideas to different stakeholders.
- operate at an advanced level in their assignments by exercising responsibility and accountability for achieving the desired team and individual outcomes.

ENTRY REQUIREMENTS (including access and inclusion)

Minimum entry requirement for this qualification is a:

NCQF level 4, Certificate IV, or equivalent with passes in relevant subjects.

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.

QUALIFICATION SPECIFICATION

SECTION B

GRADUATE PROFILE (LEARNING OUTCOMES) Holders of this qualification will:	**ASSESSMENT CRITERIA**
1. Demonstrate knowledge and understanding of trees species and associated vegetation.	1.1 Describe characteristics for tree identification. 1.2 Apply taxonomic keys accurately to analyze specific characteristics (leaf, bark, flower, and fruit) form and habits of trees, shrubs, and other plants to identify species. 1.3 Explain how to utilize a tree identification dichotomy guide. 1.4 Prepare a portfolio of local geographic-area tree species labeled with the common and scientific name. 1.5 Compare plant samples to images to identify genus and species.
2. Demonstrate the ability to measure trees and carryout forest inventory.	2.1 Establish and monitor permanent sample plots. 2.2 Describe use of different tree measuring instruments. 2.3 Apply different forest inventory sampling methods to collect data. 2.4 Estimate sampling errors, population means and variances. 2.5 Interpret and analyze data from forestry inventories.

	2.6 Apply mathematical and statistical logic and problem-solving skills to study data
3. Demonstrate ability to develop forest management plans.	3.1 Demonstrate how to use the different field data collection techniques for forest management plans. 3.2 Prepare and develop forest management plans. 3.3 Implement forest management plans. 3.4 Revise forest management plans.
4. Assess climate change impacts and prepare climate change adaptation, mitigation, and disaster risk reduction plans.	4.1 Explain the basic and scientific concepts and principles of climate change. 4.2 Describe primary greenhouse gases sources and sinks. 4.3 Explain the influence of greenhouse on the global climate systems. 4.4 Identify the anthropogenic drivers of climate change. 4.5 Explain the role of forests and woodlands in climate change, adaptation, and mitigation. 4.6 Design forestry carbon mitigation projects and implementation plans.
5. Implement natural resources policies and legislation	5.1 Demonstrate knowledge of natural resources policies and legislation. 5.2 Interpret and enforce natural resources legislation. 5.3 Explain the management and administration of forestry and related organisations.
6. Demonstrate the ability to use ICT, GIS, Remote Sensing, and traditional tools to process information	6.1 Demonstrate knowledge to use ICT, GIS, Remote Sensing and traditional tools in collection and processing data. 6.2 Apply GIS and Remote Sensing in natural resources management. 6.3 Demonstrate how to use GIS and Remote Sensing in wildland fire management.
7. Apply basic research skills, critical analysis, and independent evaluation of forest resources	7.1 Define and explain techniques to process data and derive logical conclusions. 7.2 Apply basic research to effectively to undertake forestry resources assessment. 7.3 Design field experiments collect and analyze data.

	7.4 Demonstrate practical application of statistics including forestry data sets with significant variation. 7.5 Solve problems and visualize information in statistics using graphing calculators and spreadsheets. 7.6 Interpret and critically evaluate qualitative and quantitative results in the context of original problem, and derive logical conclusions 7.7 Develop scientific and technical reports based on research information.
8. Communicate effectively with peers, superiors, subordinates, and farmers in oral and written form.	8.1 Explain appropriate ways of communicating relevant information with accuracy using proper form, structure, and style. 8.2 Evaluate and synthesize information from different sources. 8.3 Organize and clearly present relevant information. 8.4 Prepare oral presentations for delivery and lead a discussion of it. 8.5 Demonstrate how to communicate effectively with peers, superiors, subordinates, and clients using information-technology support for oral or written discourse and the presentation of reports and submissions.
9. Demonstrate ability to work effectively in multidisciplinary and multi-cultural teams efficiently to come up with solutions to problems affecting forestry	9.1 Describe how to effectively work in multidisciplinary and multi-cultural environments. 9.2 Accept comments, criticism and feedback and learn from them. 9.3 Explain fundamental forest science concepts to non-forestry experts. 9.4 Raise awareness of forestry and its importance for society. 9.5 Put new knowledge, skills and abilities, and attitudes into practice in everyday life.
10. Engage in independent and life-long learning through well-developed learning skills.	10.1 Apply professional training and social life skills within the context of forest sciences for the benefit of humankind.

	10.2 Provide solutions to forestry problems based on solid evidence and theoretical arguments, using creative and critical thinking.
11. Manage forests and forest-based enterprises	11.1 Select sites to establish nurseries, woodlots, and plantations 11.2 Establish and manage tree nursery enterprises 11.3 Manage indigenous native forests and woodlands. 11.4 Establish and manage forest man-made forests/plantations. 11.5 Proficiency in identifying forest insects and diseases. 11.6 Protect forest resources from fires, insects, and diseases. 11.7 Design, establish and manage community-based forestry projects. 11.8 Establish and manage forest- based enterprises.

QUALIFICATION STRUCTURE

SECTION C

	Title	**Level**	**Credits**
FUNDAMENTAL COMPONENT Courses	Mathematics	5	12
	General and Inorganic Chemistry	5	12
	Physics	5	12
	Biology of Cells	5	12
	Physical and Organic Chemistry	5	12
	Biodiversity	5	12
	Communication and Academic Literacy Skills	6	12
	Computer Skills Fundamentals	6	8
	Scientific Writing and Presentation Skills	7	12
CORE COMPONENT Courses	Human Resources Management	5	12
	Forest Botany	6	12
	Silviculture I	6	12
	Tree Improvement	6	12
	Forest Pathology	6	12
	Wildlife Ecology and Management	6	12
	Introduction to Biometry	6	12

	Forest Ecology	6	12
	Field Practical Training	6	12
	Soil Science	6	12
	Agroforestry	6	12
	Agricultural Extension	6	12
	Physiology of Woody Plants	7	12
	Experimental Design and Data Analysis	7	12
	Introduction to Agricultural Economics	7	8
	Soil and Water Conservation	7	12
	Silviculture II	7	12
	Forest Mensuration and Inventory	7	12
	Non-Timber Forest Products	7	12
	Forest Field Practical Course	7	12
	Research Project II	7	8
	Timber Harvesting and Wood Processing	7	12
	Forest Management and Certification	7	12
	Climate Change and Forest Resources	7	12
	Research Project II	7	8
	Natural Resources Policies and Legislation	7	12
	Community Forestry	7	12
	Forest and Range Entomology	7	12
	Fire Ecology and Management	7	12
	Geographical Information Systems	7	12
	Remote Sensing	7	12
	Financial Management in Agriculture	7	12
	Development of Entrepreneurial Skills in Agribusiness	7	12
ELECTIVE COMPONENT Courses	**Set 1 (Select one course)**		
	Principles of Crop Production	6	12
	Introduction to Animal Science	6	12
	Set 2 (Select one course)		

	Environmental Economics	6	12
	Resources Economics	6	12
	Set 3 (Select one course)		
	Land Surveying and Evaluation	7	12
	Environmental Impact Assessment	7	12
			524

Rules of combinations, Credit distribution (where applicable):

This qualification has 524 credits and requires four years to complete. The credit distribution is as follows:

Level	**Credit Value**		
	Compulsory	**Elective**	**Total**
5	84	0	84
6	176	0	176
7	228	36	264
8	0	0	0
Total	**488**	**36**	**524**

ASSEEMENT AND MODERATION ARRANGEMENTS

ASSESSMENT ARRANGEMENTS

Assessment will include both formative and summative modes.

FORMATIVE ASSESSMENT

Formative assessment will contribute 50% to the overall course grade.

SUMMATIVE ASSESSMENT

Summative assessment will constitute the other 50% of the overall course grade.

Assessment shall be carried out by BQA accredited Assessors.

Research Project: Leaners will undertake a research project as partial fulfillment of the award of the qualification.

MODERATION ARRANGEMENTS

Internal and external moderators to be engaged will be BQA accredited subject specialists in relevant fields with relevant industry experience and academic qualifications.

Both internal and external moderation shall be done in accordance with applicable policies and regulations.

RECOGNITION OF PRIOR LEARNING (if applicable)

RPL and CAT will be applicable for award of credits to contribute to the award of the qualification in accordance with institutional Policies in line with the National RPL Policy.

PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)

Learning progression Pathways

This qualification is intended to provide learners with both horizontal and vertical articulation possibilities.

Horizontal Pathways

- Bachelor of Science in Range Science at NCQF Level 7
- Bachelor of Science in Agriculture at NCQF Level 7
- Bachelor of Science in Agronomy at NCQF Level 7
- Bachelor of Science in Horticulture at NCQF Level 7
- Bachelor of Science in Agriculture Economics at NCQF Level 7
- Bachelor of Science in Agricultural Education at NCQF Level 7
- Bachelor of Science in Agricultural Extension at NCQF Level 7
- Bachelor of Science in Agricultural Mechanization at NCQF Level 7
- Bachelor of Science in Soil and Water Engineering at NCQF Level 7
- Bachelor of Science in Environmental Science at NCQF Level 7
- Bachelor of Science in Wildlife Management at NCQF Level 7

Vertical Pathways

Holders of this qualification can progress to postgraduate, master's qualifications such as:

- Bachelor of Science Forest Sciences Honours at NCQF Level 8
- Post Graduate Diploma in Forest Management at NCQF Level 8
- Post Graduate Diploma in Forestry at NCQF Level 8
- Post Graduate Diploma in Environmental Forestry at NCQF Level 8
- Postgraduate Diploma in Environmental Management NCQF Level 8

- Master of Science in Sustainable Forest and Nature Management at NCQF Level 9
- Master of Science in Forest Sciences at NCQF Level 9
- Master of Science in Environmental Forestry at NCQF Level 9
- Master in Forest and the Environment at NCQF Level 9
- Master of Science in Forest Ecology and Management NCQF Level 9
- Master of Science in Natural Resources Management at NCQF Level 9
- Master of Science in Forest and Nature Conservation at NCQF Level 9
- Master of Forestry NCQF Level 9
- Master of Science in Environmental Science NCQF Level 9
- Master of Science in Environmental Management NCQF Level 9
- Master of Science in Agroforestry NCQF Level 9
- Master of Science in Silviculture NCQF Level 9
- Master of Science in Arboriculture and Urban Forestry NCQF Level 9

Employment Pathways

Graduates can be employed as:

- Scientific Officers
- Forest Managers
- Silviculturist
- Fire Ecologist
- Natural Resource managers
- Policy Analysts
- Forestry Technicians
- Urban Foresters
- Forest Advisors
- Forest Rangers
- Project managers
- Environmental and natural resources managers
- Forestry Consultants

QUALIFICATION AWARD AND CERTIFICATION

Minimum standard of achievement for the award of the qualification

For a Candidate to achieve this qualification they must have acquired a minimum of **524** credits. The Candidate should pass all the **Core, Fundamental** and **Electives** modules.

Certification

A **Bachelor of Science in Forest Sciences** certificate and transcript will be awarded to a candidate upon completion of the qualification in accordance with applicable policies.

REGIONAL AND INTERNATIONAL COMPARABILITY

This qualification was compared with similar of equivalent qualifications from various institutions in the region and abroad. Information gathered shows that there is no institution locally which offers undergraduate qualification in Forest Sciences.

Region

In the region, the following universities and their qualifications were taken for benchmarking

1. Stellenbosch University, South Africa offer a four (4) year BSc (For.) (Forestry and Natural Resources Sciences). The qualification introduces learners to the entire forest and forest products value chain, including the growing and harvesting of timber, socioeconomics, management and conservation ecology.

Similarities

The qualification offered by Stellenbosch University, South Africa consists of modules/courses such as Biology, Chemistry, Physics, Biometry, Computer Skills, Forest Mensuration and Inventory, GIS, Soil Science, Silviculture, Timber Harvesting, Forest Management and Research Project are also included in this qualification. Both qualifications have a duration of four years, and they don't have exit awards.

Differences

Leaners from this qualification graduate with a BSc in Forest Sciences, whereas the Stellenbosch University learners graduate with a BSc in Forestry and Natural Resources Science. This qualification has 34 credits more than the Stellenbosch qualification. The Stellenbosch University has more emphasis of wood Science and wood products modules.

2. **Soikoine University of Agriculture (SUA), Tanzania** offers a three-year (3) BSc in Forestry qualification that aims to development leaner's knowledge, competence and ability to apply principles of forestry in terms of science research and delivery of advisory services and practice for sustainable development.

Similarities

This qualification compares well with that offered by SUA. Most of the of the courses for the two qualifications are similar in name and in the context except a few. Courses common to the qualification include but not limited to Introduction to Biometry, Human Resources Management, Communication Skills, Silviculture, Tree Improvement, Agroforestry, Forest Mensuration and Inventory, GIS, Soil Science, Forestry Practical Work, Research Project, Forest Management, Natural Resources and Environmental Economics etc. The two qualifications offer courses that enable learners to develop entrepreneurship skills, apply similar mode of qualification and don't not have exit awards.

Differences

The two qualifications differ in duration and total credits. This qualification will be running for four (4) academic years compared to the SUA which runs for three (3) years. The two qualifications differ in credit value; at SUA the learner is expected to accomplish 98 credits to be awarded the degree, while with this qualification, the learner should accomplish 524 credits to be awarded a degree.

3. **Lilongwe University of Agriculture and Natural Resources (LUANAR), Malawi** offers a four-year BSc in Forestry qualification.

Similarities

The qualification offered by LUANAR, Malawi consists of courses such as Biology, Chemistry, Mathematics, Physics, Communication Skills, Silviculture, Forest Botany, Ecology, Entrepreneurship, Forest Mensuration and Inventory, Eco-Physiology of Woody Plants, Forest Entomology, Soil Science Research Project, GIS and Remote Sensing, Community Forestry, Agroforestry, Forest Attachment, Tree Improvement, Forest Pathology, Non-Timber Forest Products which are also included in this qualification. The two qualifications have a similar duration of 4 years and do not have exit awards.

Differences

The two qualifications differ in the number of credits allocated to courses. The credits for LUANAR courses range from 0.5- 3.5 while the range for this qualification is 8-12 credits. The total credit value for the LUANAR qualification is 158.5 while for the proposed qualification is 524 credits.

Internationally

Internationally, the following universities and their qualifications were taken for benchmarking:

1. **Southern Cross University (SCU), Australia**, offers Bachelor of Forest Science and Management which aims to equip learners with the foundational scientific knowledge in forest systems. The qualification prepares the learners with the know-how to find solutions.

Similarities

SCU qualification have common courses with this qualification, like; Biology, Chemistry, Silviculture, Fire Ecology and Management, GIS, Agroforestry, Ecology, Botany and Measuring Trees and Forests. Some courses common the two qualifications are named different, but with similar contents. Both qualifications have a duration of four (4) years.

Differences

The two qualifications differ because learners form SCU graduate with a BSc in Forest Science and Management compared to BSc Forest Sciences in this qualification. The total credits for this qualification are 524 compared to 384 for SCU. This qualification does not have exit awards. In the SCU qualification learners are eligible to exit with a Diploma of Environmental Science after completing 96 credit points, comprising of 8 core first year units, with no more than 48 credit point awarded as advanced standing. Learners may be illegible to exit with an Associate Degree of Environmental Science after completing 192 credit points comprising 8 core units and 8 elective units with no more than 96 credits points awarded as advanced standing.

2. **Tribhuvan University, Institute of Forestry, Nepal** offers a BSc in Forestry qualification with many common courses with this qualification like: Forest Botany, Mathematics, Biodiversity, Forest Management, Tree Physiology, Soil Science, Forest Law and Policy, Agroforestry, Tree Improvement, Silviculture, Forest Ecology, Soil and Water Conservation, Non-Timber Forest Products, Forest Management, Field Practical Training, Community Forestry, Remote Sensing and GIS. The two qualifications have a similar duration of 4 years, and both do not have exit awards.

Differences

The Tribhuvan University qualification has more courses, hence higher total credit value compared to this qualification.

REVIEW PERIOD

The qualification will be reviewed every five years, after running its full cycle. However, ad-hoc reviews will be done in line with environmental changes.