QUALIFICATION SPECIFICATION							SECTION A
QUALIFICATION DEVELOPER	**Botswana University of Agriculture and Natural Resources**						
TITLE	**Bachelor of Science in Range Science**				**NCQF LEVEL**	7	
FIELD	**Agriculture and Nature Conservation**		**SUB-FIELD**	**Range Science**			
New qualification	✓	Review of existing qualification					
SUB-FRAMEWORK	General Education		TVET		Higher Education	✓	
QUALIFICATION TYPE	Certificate		Diploma		Bachelor	✓	
	Bachelor Honours		Master		Doctor		
CREDIT VALUE					**520**		

RATIONALE AND PURPOSE OF THE QUALIFICATION

Rationale

According to vision 2016, Botswana anticipated to have an informed and enlightened citizen by 2016. Vision 2016 has been reasserted in vision 2036 to align the country's development ambitions with the global agenda on sustainable development goals. Realisation of the potential contribution of rangeland resource requires trained manpower in Range Science. Increased number of qualified graduates is believed to have a direct relation with the knowledge-based and fast-growing economy. Knowledge generation can also bring considerable impact in terms of socio-cultural development, improved lifestyle, food security and ecosystem health that aligns with the United Nations Sustainable Development Goals (SDGs: Goals 2, 6, 7, 8, 13 and 15), as foreseen in Vision 2036. These all require human, financial, and physical resources, qualified expertise, up-to-date information, functioning markets, well-organized institutions, enabling policies and effective regulation.

Botswana has envisioned to grow into a high-income country, with an export-led economy reinforced by diversified, comprehensive and sustainable development as determined by high level of efficiency. Such type of vision is only realized through a knowledge-based economy, involving the use of high-quality science, technology and innovation that can drive the economy to a higher level of efficiency (Government of Botswana, 2016). Botswana has also aspired to develop a globally modest workforce that is productive, creative and has intercontinental exposure by 2036 (Vision 2036). This will lead the country towards sustainable growth endowed with skill set that are relevant, offering local, regional and international opportunities.

The Agricultural Sector of the Human Resource Development Plan (HRDC, 2015) indicates that range ecologists and/or range professionals are in high demand. Generally, the rangeland resource is poorly managed and underutilized due to shortage of trained manpower in Range Science. Thus, the qualification in Range Science aims at producing qualified graduates with theoretical and practical skill sets that will contribute to the achievement of Vision 2036 through the management, sustainable utilization, and conservation of rangeland biodiversity.

Purpose

The purpose of the BSc qualification in Range Science is to produce graduates who:

1) will be able to identify appropriate scenarios to apply the basic principles of Range Science at national, regional and international levels;
2) will be able to properly apply specialized knowledge, specialized basic and applied research skills to solve problems and apply a range of advanced technical procedures and skills to generate solutions to unpredictable and complex problems under climate change;
3) will be able to demonstrate considerable responsibility and accountability for their work output and of others within the Range Science profession and related fields.

ENTRY REQUIREMENTS (including access and inclusion)

- The minimum entry requirement is Certificate IV, NCQF Level 4 (general education or TVET) or other equivalent with passes in relevant subjects.
- RPL and CAT will be applicable and or considered for applicants who do not meet the above stated minimum requirements and will be aligned to institutional and national polices

QUALIFICATION SPECIFICATION SECTION B

GRADUATE PROFILE (LEARNING OUTCOMES)	ASSESSMENT CRITERIA
Holders of this qualification will be able to: 1. Demonstrate and apply specialized knowledge to identify range resources such as soil properties, plant species and animals, and their importance to the society.	1.1. Use key terminologies proficiently when identifying features of plants and animals; 1.2. Apply taxonomic keys accurately to analyse specific attributes of organisms (i.e. plants, animals including their parts) morphological characteristics and habits of organisms to identify them at species level; 1.3. Prepare a portfolio of common and endangered range plant specimens labeled with common names and binomial nomenclatures; 1.4. Establish and manage Herbarium and Botanical Garden; 1.5. Develop an understanding of applying a species identification dichotomy guides; 1.6. Compare plant samples with existing images or specimens to identify their genus and species names; 1.7. Conduct forage biomass measurement; 1.8. Develop grazing calendar and apply proper grazing management systems;
2. Apply specialized knowledge and skills to restore/rehabilitate degraded rangelands.	2.1. Design improvement techniques to rehabilitate degraded rangelands;

	2.2. Implement the different levels for controlling (prevention, control and eradication) invasive and poisonous plants in the rangelands; 2.3. Conduct demonstrations on the use of mechanical methods of controlling invasive plant species in the rangelands; 2.4. Utilize biological, mechanical and chemical methods of controlling invasive and poisonous plants in the rangelands; 2.5. Develop guide lines for the implementation of rangeland restoration and rehabilitation.
3. Apply specialized knowledge and range of advanced technical processes and skills to conduct range inventory and monitoring.	3.1. Identify resources available in a given region; 3.2. Sample vegetation seasonally to determine biomass and species composition; 3.3. Determine and document the availability of water points for livestock and wild animals; 3.4. Conduct range inventory through field data collection across different habitats and seasons; 3.5. Identify and record current number and type of livestock utilising range resources to determine grazing capacity; 3.6. Establish permanent sample plots and monitor range trends; 3.7. Develop and implement range management plans; Develop locally appropriate and climate resilient range management models
4. Critically analyse and interpret forage supply and demand to balance the number of livestock to rangeland resources.	4.1. Collect representative samples and calculate total forage production; 4.2. Apply the standard correction factor to calculate the actual forage supply at a time; 4.3. Calculate the forage demand per animal according to the daily requirement of each animal type; 4.4. Establish the duration of forage utilization in a paddock/grazing area; 4.5. Calculate the total forage needed to sustain animals during specific duration of grazing; 4.6. Calculate carrying capacity/stocking rate to balance number of animals to the capacity of rangelands in the country. 4.7. Analyse the impact of grazing pressure on range resources from time to time;

5. Apply specialized knowledge including understanding of local situations and scientific methods to assess impact of drought/climate variability and develop adaptation and mitigation strategies.	5.1. Assess and determine the number of livestock seasonally to adjust the numbers to the available forage; 5.2. Recommend destocking or restocking as the depending on the condition of drought 5.3. Create community awareness for drought early warning and conservation of surplus forage for dry season; 5.4. Explain the basic concepts and principles of climate variability and change; 5.5. Explain the influence of drought on livestock and herders livelihoods; 5.6. Develop and apply drought early warning systems for adaptation and mitigation; 5.7. Demonstrate carbon sequestration measures to reduce the impact of climate change; 5.8. Apply knowledge and skills for making surplus feeds for drought contingencies.
6. Apply capacity to carry out processes that require the use of specialized basic and applied research skills and outputs to inform policies and develop legislation to guide rangeland resource management.	6.1. Demonstrate knowledge of rangeland resource management guiding policies and legislation; 6.2. Analyse, interpret and enforce rangeland resources' utilization regulation; 6.3. Develop guide line and enforce appropriate land use policy and administration of range resources.
7. Apply knowledge and technical skills to address solutions to unpredictable and complex problems such as fluctuating forage productivity using GIS, Remote Sensing technologies and indigenous knowledge system to critically analyze and interpret information related to rangeland resources.	7.1. Demonstrate knowledge to use ICT, GIS, Remote Sensing and indigenous ecological knowledge in collection and processing of data; 7.2. Apply GIS and Remote Sensing in rangeland resources management; 7.3. Demonstrate knowledge to use GIS and Remote Sensing to analyse past and present trends of fire patter and fuel load mapping, weather condition mapping, and fire intensity evaluation.
8. Apply basic research skills, critical analysis and independent evaluation of range resources.	8.1. Define and explain techniques to process data and derive logical conclusions; 8.2. Apply basic research in to effectively to undertake range resources assessment; 8.3. Design field experiments collect and analyse data;

	8.4. Identify practical application of statistics including range data sets with significant variation; 8.5. Interpret and critically evaluate qualitative and quantitative results in the context of original problem, and make recommendations; 8.6. Develop scientific and technical reports based on research information.
9. Apply specialized knowledge and a range of technical skills to communicate effectively with peers, superiors, subordinates, and farmers in oral and written form.	9.1. Effectively communicate relevant information with accuracy using proper form, structure and style; 9.2. Evaluate and synthesize information from different sources; 9.3. Organize and clearly present relevant information. 9.4. Prepare oral presentations for delivery and lead a discussion of it; 9.5. Communicate effectively with peers, superiors, subordinates and clients using information-technology support for oral or written discourse and the presentation of reports and submissions.
10. Apply specialized knowledge, methods, and technical skills to work effectively in multidisciplinary and multi-cultural teams efficiently to come up with solutions to problems affecting rangelands	10.1. Effectively work in multidisciplinary and multi-cultural environment; 10.2. Accept comments, criticism and feedback and learn from them; 10.3. Explain the importance of rangeland to experts in other fields of studies; 10.4. Raise awareness of range resource and its importance for society.
11. Engage in independent and life-long learning through well-developed learning skills.	11.1. Apply professional training and social life skills within the context of range sciences for the benefit of humankind; 11.2. Provide solutions to rangeland problems based on solid evidence and theoretical arguments, using creative and critical thinking.
12. Apply specialized knowledge including understanding methods, codes of practices and capacity for critically analyze and interpretation of information to manage range resources and ranch-based enterprises.	12.1. Establish and manage ranch business; 12.2. Manage indigenous native grasses, forbs and woody plants; 12.3. Establish and manage forage resource and pastures; 12.4. Proficiency in identifying invasive and poisonous plants and environmental stresses; 12.5. Design, establish and manage community-based forage/feed resources projects;

	12.6. Establish and manage range resource-based enterprises.

QUALIFICATION STRUCTURE			SECTION C
FUNDAMENTAL COMPONENT Courses	**Title**	**Level**	**Credits**
	Mathematics I	5	12
	General and Inorganic Chemistry	5	12
	Physics I	5	12
	Biology of Cells	5	12
	Mathematics II	5	12
	Physical and Organic Chemistry	5	12
	Physics II	5	12
	Biodiversity	5	12
	Communication and Academic Literacy Skills I	6	12
	Computer Skills and Fundamentals I	6	8
	Communication and Academic Literacy Skills II	6	12
	Computer Skills and Fundamentals II	6	8
CORE COMPONENT Courses	Biological Systematics	6	12
	Introduction to Agricultural Economics	6	8
	Introduction to Range Science	6	8
	Range Ecology	6	12
	Range Grasses, Forbs and Woody Plants	6	12
	Wildlife Ecology and Management	6	12
	Soil Science	6	12
	Forest and Range Entomology	6	12
	Range Plant Ecophysiology	6	12
	Field Practical Training I	6	12
	Biometry I	6	8
	Land Surveying and Evaluation	6	12
	Environmental change in Southern Africa	7	8
	Conservation Ecology	7	12
	Community Forestry	7	12
	Remote sensing	7	12
	Geographical Information Systems	7	12
	Field Practical Training II	7	12
	Environmental Economics	7	12
	Agricultural Extension	7	12
	Game Farming and Ranching	7	8
	Project I	7	8
	Biometry II	7	8
	Range Analysis	7	12
	Project II	7	8
	Range Development and Improvements	7	12
	Range Animal Management	7	12

	Range Resource Management	7	12
	Forage Husbandry and Range Animal Nutrition	7	12
	Farm Business management	7	8
	Financial Management in Agriculture	7	12
	Development of Entrepreneurial Skills in Agribusiness	7	12
ELECTIVE COMPONENT	**Take one course from (12 credits each)**		
	Watershed Management	6	12
	Fresh Water System Management	6	
	Take one course from (12 credits each)		
	Financial Management in Agriculture	7	12
	Natural Resources Policies and Legislation	7	
	Take one course from (12 credits, each)		
	Soil and Watershed Conservation	7	12
	Environmental Impact Assessment	7	

Rules of combinations, Credit distribution (where applicable):

Level		Total Credits
Fundamental:	5	96
	6	52
Core:	6	120
	7	216
Electives:	6	12
	7	24
TOTAL		**520**

ASSEEMENT AND MODERATION ARRANGEMENTS

ASSESSMENT ARRANGMENTS

Assessment strategies, requirements and weightings

Assessment arrangements

All assessments, formative and summative, leading/contributing to the award of credits or qualification will be based on learning outcomes and/or sub-outcomes.

Formative assessment

Formative assessment or continuous assessment contributing towards the award of credits will be based on qualification outcomes.

The contribution of formative assessment to the final grade is 50%

Summative assessment

- Candidates will undergo assessment including written final examinations for each course which contribute 50% of the final mark of each course.
- For a candidate to pass a course, a final combined mark of 50% is required.

MODERATION ARRANGEMNTS

- The purpose of the moderation is to ensure that assessment and marking across all courses is fair, valid and reliable. It also ensures that the assessment tool is aligned to the learning outcomes, that it is set at appropriate level of study and, that the process of marking is consistent.

Internal Moderation

- Moderation for all continuous assessment tools like tests and final examinations shall be carried out by internal moderators who are qualified and experienced academic staff who have been trained and accredited by BQA as assessors and moderators.

External Moderation

- There shall be provision for external moderation as a quality assurance measure.

RECOGNITION OF PRIOR LEARNING (if applicable)

- RPL and CAT will be applicable for award of this qualification. This will be conducted as per individual ETP RPL and CAT policies which must be aligned to the BQA RPL and Policies

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 Forest Science at NCQF Level 7
- BSc in Agriculture at NCQF Level 7
- BSc in Agronomy at NCQF Level 7
- BSc in Animal Science and Production at NCQF Level 7
- BSc in Agriculture Economics at NCQF Level 7
- BSc in Agricultural Education at NCQF Level 7
- BSc in Agricultural Extension at NCQF Level 7
- BSc in Agricultural Mechanization at NCQF Level 7
- BSc in Soil and Water Engineering at NCQF Level 7
- BSc in Environmental Science at NCQF Level 7
- BSc in Wildlife Management at NCQF Level 7

- BSc in Fisheries and Aquatic Resources at NCQF Level 7
- BSc in Atmospheric Science at NCQF Level 7
- BSc in Biodiversity at NCQF Level 7
- BSc in Biology at NCQF Level 7

Vertical Pathways

Holders of this qualification can progress to postgraduate, masters qualifications such as:

- BSc in Range Science Honours at NCQF Level 8
- BSc in Forest Sciences Honours at NCQF Level 8
- Post Graduate Diploma in Range Management at NCQF Level 8
- Post Graduate Diploma in Range Ecology at NCQF Level 8
- Post Graduate Diploma in Environmental Science at NCQF Level 8
- Post Graduate Diploma in Climate Science NCQF Level 8
- MSc in Range Ecology and Management at NCQF Level 9
- MSc in Forest Ecology and Management NCQF Level 9
- MSc in Natural Resources Management at NCQF Level 9
- MSc in Nature Conservation at NCQF Level 9
- MSc in Animal Science at NCQF Level 9
- MSc in Environmental Management NCQF Level 9
- MSc in Environmental Physiology at NCQF Level 9
- MSc in Botany at NCQF Level 9
- MSc in Ecology at NCQF Level 9

Employment Pathways

Graduates from this qualification can be employed as:

- Self-employment in rangeland-based enterprises
- Scientific Officers
- Range Manager
- Ranch Manager
- Range Ecologist
- Fire Ecologist
- Natural Resource managers
- Policy Analysts in Range Sector
- Non-governmental organizations (NGOs) concerned with rangeland and rural development
- Range Science Technician
- Rangeland Advisors
- Project management specialists
- Environmental and natural resources managers
- Rangeland Resources Consultants

QUALIFICATION AWARD AND CERTIFICATION

Minimum standard of achievement for the award of the qualification

A candidate is required to achieve **total credits of 520** inclusive of fundamental, core and elective components to be awarded the **Bachelor of Range Science** qualification. All the learning outcomes should

be met for award of the qualification. The qualification does not have exit awards, but candidates may be given transcript.

Certification
The learner meeting prescribed requirements will be issued a certificate in accordance with standards prescribed for the award of the qualification and applicable policies.

REGIONAL AND INTERNATIONAL COMPARABILITY

Regionally
Regionally and internationally, the following universities and their qualifications were considered for benchmarking.
1. Sokoine University of Agriculture offers a three (3) year BSc (Range Science). The qualification introduces learners to the entire range resources management and products value chain, including forage productivity, wildlife management, watershed management, and socioeconomics, management, and conservation of rangeland ecosystem.

Similarities
The qualification offered by Sokoine University of Agriculture, Tanzania consists of modules/courses such as Introduction to Range Management, Introduction to Ecology, Range Plant Ecophysiology, Communication Skills, Animal Grazing Behaviour and Management, Management of Drylands, Rangeland Biodiversity, Utilization and Conservation, Game Farming, Pasture Establishment and Management, Range Inventory and Monitoring, Remote Sensing and GIS, Integrated Watershed Management, Ranch Planning and Management, Range Improvement, Environmental Impact Assessment, Research Project are also included in this qualification. The qualification has a duration of three years and it does not have exit awards.

Differences
Leaners from this qualification graduate with a BSc in Range Sciences, whereas the Sokoine University of Agriculture learners graduate with a BSc in Range Management. This qualification this qualification has four years duration while the qualification at Sokoine University of Agriculture is a three-year duration with less credits. The qualification at Sokoine University of Agriculture has more emphasis of range management and animal production whereas this qualification focuses on Range Sciences with an interdisciplinary foundation for science-based decision making in natural resource management.

Internationally
Internationally, the following universities and their qualifications were used for benchmarking:
1. University of Nevada (USA) offers Bachelor of Range Ecology and Management which aims to equip learners with the foundational scientific knowledge in Range Sciences. The qualification prepares the learners with the know-how to find solutions to societal problems.

Similarities

University of Nevada qualification has common courses with this qualification, such as Mathematics, General Chemistry, Communication Skills, Wildlife Ecology and Management, Range and Forest Plants, Range and Restoration Ecology, Natural Resource Ecology, Soils, Ecophysiology of Range Plants, Principles of rangeland management, Rangeland Ecosystems, Rangeland Resource Management. Both qualifications do not have exit awards.

Differences

The two qualifications differ because learners form the University of Nevada graduate with a BSc in Range Ecology and Management compared to BSc Range Sciences in this qualification. The total credits for this qualification are 520 compared to 480 for the University of Nevada.

2. Oregon State University (USA)**,** offers a BSc in Range Science qualification with many common courses with this qualification like: Plant ecology, Soil science, Rangeland and natural resource economics, Recreation resource management, Ecohydrology, Wildland plant identification, Shrubland or grassland ecology, Rangeland inventory and analysis, Wildland restoration, Rangeland management planning, Rangeland management, GIS applications. The two qualifications have a similar duration of 4 years and both do not have exit awards.

Differences

The Oregon State University qualification has less credits (460), hence lower total credit value compared to this qualification. The other difference is that the Oregon State University qualification has four specialization options Habitat management, Pastoral systems of the world, Sustainable livestock ranching, and Sustainable rangeland ecosystem stewardship.

REVIEW PERIOD
The qualification will be reviewed every 5 years.